The Ideal Fitter

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AMERICAN RADIATOR BUILDING

40 West 40th Street *New York City*

The
IDEAL FITTER

TRADE MARK
Reg. U. S. Pat. Office

21st Edition

AMERICAN RADIATOR COMPANY

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National Radiator Company, Ltd. (England)
London   Hull

Compagnie Nationale des Radiateurs (France)
Paris   Dole   Aulnay

Societa Nazionale die Radiatori (Italy)
Milan   Brescia

National Radiator Company, Ste Ame Belge (Belgium)
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Compania de Radiadores (Spain)
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Dominion Boiler and Radiator Co., Ltd. (Canada)
Toronto   Brantford

FOREWORD

The series of IDEAL Boilers and other heating equipment described in this edition of the IDEAL Fitter is the best and most comprehensive that has ever been offered to the heating profession. As such, it presents a new and greater opportunity to render more and better service to the people—the only permanent foundation for the continued development of any industry or any business unit.

The new group of IDEAL Boilers is complete in type range, heating range and price range. It extends specifically to smaller homes of moderate circumstances, the opportunity to enjoy completely the genuine comfort and economy of radiator heating. In thus offering to the many, the advantages heretofore confined to the relatively few, it represents an immense social asset certain of immediate and enthusiastic appreciation.

Higher standards in heating service are attained throughout the line, equalling in effect many of the outstanding contributions of modern science in other fields of activity.

Perfectly controlled combustion has been secured for the first time in the history of commercial heating boilers; automatic heat regulating devices have been perfected, more accurate and dependable than any heretofore known; the method of controlling the heat output of individual boilers has been simplified to a degree that will appeal instantly to houseowners. These are but a few of the many points of improvement. Taken as a whole, they constitute undoubtedly a greater step in progress than has ever been

made during any single year since steam and hot water heating was introduced, and one that will go far in bringing to the heating profession that vastly larger portion of the nation's business which properly belongs to it by right of service value.

Realizing the profound significance of these changes and improvements, we have felt the necessity of making this edition of the IDEAL Fitter somewhat different in character from its predecessors. It points out the particular field of service for which each heating unit is designed and explains why each unit is especially well adapted to render the greatest possible service in its field. It sets forth these facts briefly, yet in such a way as to afford the basis for a comprehensive and honest statement to any customer to assure him that he is buying the best.

We should like to take this opportunity to express our appreciation to our friends in the trade whose kind and practical suggestions have greatly helped us in developing our products.

Faithfully,

AMERICAN RADIATOR COMPANY

SERVICE

IDEAL Boilers are obtainable in all sections of the United States and Europe. Located in four cities in this country are five foundries of the most modern type. From these plants IDEAL Boilers are distributed to warehouses in twenty-four cities. In addition to these company warehouses there are many more cities where stocks are carried by leading jobbers. To the owner this means quick delivery, to the trade prompt service, to the engineer and architect the knowledge that no matter where his client's building may be located IDEAL Boilers and American Radiators are available.

IDEAL Boilers are manufactured in the following cities:

Buffalo
Detroit
Kansas City
Birmingham.

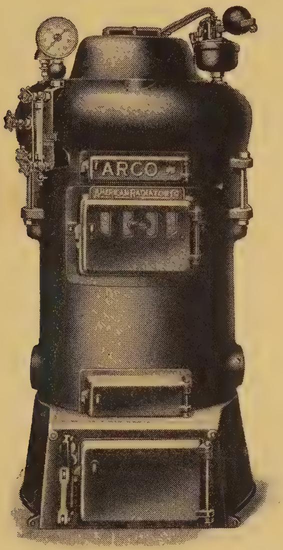
American Radiator Company Warehouses are located in the following cities:

New York
Bayonne
Boston
Providence
Portland (Me.)
New Haven
Philadelphia
Baltimore
Washington
Richmond
Buffalo
Pittsburgh
Detroit
Birmingham
Cincinnati
Chicago
Milwaukee
St. Louis
St. Paul
Omaha
Kansas City
Denver
San Francisco
Seattle

IDEAL BOILERS

INDEX

IDEAL ARCO ROUND BOILER

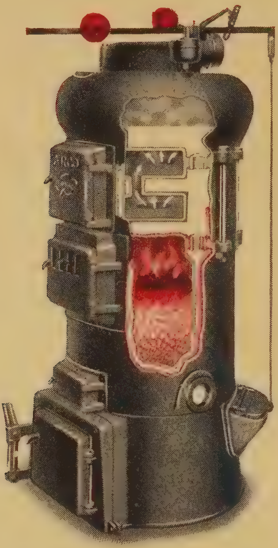


Patented Feb. 12, 1918

Burns All Kinds of Fuel

Steam Capacity—350 to 1700 sq. ft.
Water Capacity—600 to 2825 sq. ft.

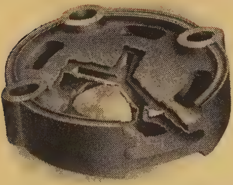
FOR homes and all other buildings within the limits of its rated capacities, the IDEAL Arco Round Boiler may be offered with one of the greatest recommendations that any boiler can command—years of distinguished service. To-day it is undoubtedly the most popular boiler of its kind in America.



Cutaway view showing deep fuel bed, flue travel, and easily cleaned heating surface.

The special favor in which this boiler is held is due to the many superior features of merit in its design and construction. To house-owners and caretakers, these features have meant quick heat generation on every desired occasion; absolutely dependable heating service with economy in fuel consumption; and continued, satisfactory performance with a very small amount of attention.

The IDEAL Arco Round Boiler described and illustrated herein unites every point of excellence which has contributed to the establishment of its reputation; but it combines other factors which still further commend it. Outstanding among



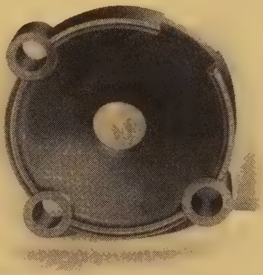
Double Intermediate Section

these is the increase in the boiler's direct, fire-contact heating surface, fuel capacity, and heat generating capacity.

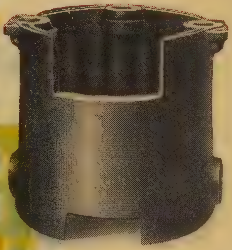
The quick heating response and economy of operation characterizing the IDEAL Arco Round Boiler are due in large measure to its exclusive Third Nipple construction, illustrated on the following page. This construction effects a continuous, rapid, unimpeded circulation of the water within the boiler—giving to it an exceptional "pick-up" capacity. In the case of the water boiler, hot water begins to rise out of the boiler and flow through the heating system almost immediately after the fire is lighted; while in the steam boiler, the quickest possible steam generation after firing is insured.

Where the IDEAL Arco Round Boiler is installed, the occupants of the home can rise and breakfast in comfort on the coldest mornings of mid-winter.

Balancing the Third Nipple construction is the large, well designed fire pot, the carefully proportioned flue areas and baffled gas travel—the entire design calculated to give the best performance under chimney conditions as they are actually found in practise, and at the same time maintain the greatest economy of fuel consumption.



Single Intermediate Section



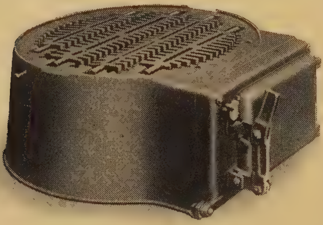
Firepot Showing Third Rear Nipple

Attention is also directed to the broad and high dome on the IDEAL Arco Steam Boiler. This provides an unusually large steam disengaging surface and storage space, commensurate with the exceptionally rapid steam generating capacity of the boiler. Dry steam at the outlet is insured.

And in common with the construction of all IDEAL Boilers, the contact faces of all doors on this boiler are ground to smoothness, so preventing excess air infiltration at these sources. Excess air infiltration in a boiler reduces the temperature of the gases of combustion and causes considerable heat waste.

All points of construction in the IDEAL Arco Round Boiler lead to permanent efficiency.

The heavy, substantial character of the doors, plate work and hinge pins; the well proportioned shaking apparatus, the large ash pit, the specially trussed and justly famous Arco grates, the large clean-out door—all bear witness to the thoroughness with which each detail has been designed to insure perfectly satisfactory service with the least amount of attention.



Base with grates in place

Steam Boiler Ratings and Data

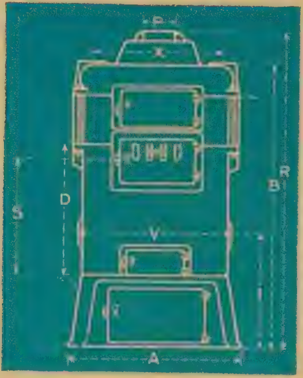
Number of Boiler	Steam Rating Sq. Ft.	Water Line Ins.	Grate Area Sq. Ft.	Hard Coal Fuel Capacity Lbs.	Size of Outlet and Inlet Ins.*	Chimney Size Ins.	Chimney Height Ft.
S-1704	350	47	1.40	140	2½	8x8	30
S-1904	500	45	1.88	184	2½	8x8	30
S-2004	625	46	2.23	217	3	8x8	30
S-2204	775	47	2.62	268	3	10x10	35
S-2504	950	48	3.53	355	3½	10x10	35
S-2804	1200	49	4.36	476	4	10x10	35
S-3104	1500	51	5.30	608	4	12x12	40
S-1705	400	51	1.40	140	2½	8x8	30
S-1905	550	50	1.88	184	2½	8x8	35
S-2005	675	51	2.23	217	3	8x8	35
S-2205	825	52	2.62	268	3	10x10	35
S-2505	1025	53	3.53	355	3½	10x10	40
S-2805	1300	54	4.36	476	4	12x12	40
S-3105	1600	56	5.30	608	4	12x12	40
S-1706	450	56	1.40	140	2½	8x8	35
S-1906	600	55	1.88	184	2½	8x8	35
S-2006	725	55	2.23	217	3	10x10	35
S-2206	875	56	2.62	268	3	10x10	40
S-2506	1100	58	3.53	355	3½	10x10	40
S-2806	1400	59	4.36	476	4	12x12	45
S-3106	1700	62	5.30	608	4	12x12	45

*Steam boilers have one outlet and two inlets.
Safety Valve sizes accord with A.S.M.E. boiler code.

Equipment

TRIMMINGS.—Regular trimmings include Safety Valve, Steam Gauge and Regulator.
FIRING TOOLS.—Slice Bar, Flue Brush and Handle, Scraper.

IDEAL ARCO ROUND BOILER

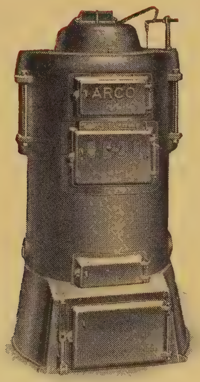


Steam Boiler Dimensions

Measurements are in inches

No.	A	D	I	P	S	V	B	E	G	R
S-1704	24⅝	24¾	16⅜	8	21½	21¾	53⅛	10⅞	24¼	60¼
S-1904	27	23⅜	16¼	8	20⅜	24⅛	52½	11½	26¾	59⅝
S-2004	28⅞	23⅜	16¼	8	20½	25½	51½	11⅛	28⅜	58¼
S-2204	30⅛	24⅜	16⅞	9	21¼	27⅝	54	11½	30⅜	62¼
S-2504	33⅛	25¼	17	9	22	30⅛	55⅝	12⅜	33⅛	63⅜
S-2804	36¾	26¼	17⅝	10	23⅛	34⅛	57⅝	13⅛	37⅛	66⅝
S-3104	39⅛	27⅜	16¾	10	23⅞	36⅞	59¾	14	40⅜	68⅝
S-1705	24⅝	24¾	16⅜	8	21½	21¾	57⅝	10⅞	24¼	64¾
S-1905	27	23⅜	16¼	8	20⅜	24⅛	57	11½	26¾	64⅛
S-2005	28⅞	23⅜	16¼	8	20½	25½	56⅛	11⅛	28⅜	62⅞
S-2205	30⅛	24⅜	16⅞	9	21¼	27⅝	58½	11½	30⅜	66¾
S-2505	33⅛	25¼	17	9	22	30⅛	60¼	12⅜	33⅛	68
S-2805	36¾	26¼	17⅝	10	23⅛	34⅛	62⅝	13⅛	37⅛	71⅝
S-3105	39⅛	27⅜	16¾	10	23⅞	36⅞	65	14	40⅜	73⅞
S-1706	24⅝	24¾	16⅜	8	21½	21¾	62¼	10⅞	24¼	69⅜
S-1906	27	23⅜	16¼	8	20⅜	24⅛	61⅝	11½	26¾	68¾
S-2006	28⅞	23⅜	16¼	8	20½	25½	60¾	11⅛	28⅜	67½
S-2206	30⅛	24⅜	16⅞	9	21¼	27⅝	63¼	11½	30⅜	71½
S-2506	33⅛	25¼	17	9	22	30⅛	65⅜	12⅜	33⅛	73⅛
S-2806	36¾	26¼	17⅝	10	23⅛	34⅛	67⅞	13⅛	37⅛	76⅞
S-3106	39⅛	27⅜	16¾	10	23⅞	36⅞	70⅜	14	40⅜	79¼

For prices see current Trade Discount Sheet.



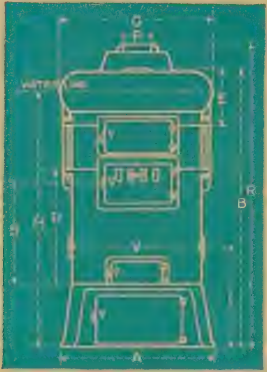
Water Boiler Ratings and Data

Number of Boiler	Water Rating Sq. Ft.	Grate Area Sq. Ft.	Hard Coal Fuel Capacity Lbs.	Size of Outlet and Inlet Ins.*	Chimney Size Ins.	Chimney Height Ft.
W–1704	600	1.40	140	2½	8x8	30
W–1904	850	1.88	184	2½	8x8	30
W–2004	1050	2.23	217	3	8x8	30
W–2204	1300	2.62	268	3	10x10	35
W–2504	1575	3.53	355	3½	10x10	35
W–2804	1975	4.36	476	4	10x10	35
W–3104	2475	5.30	608	4	12x12	40
W–1705	675	1.40	140	2½	8x8	30
W–1905	925	1.88	184	2½	8x8	35
W–2005	1125	2.23	217	3	8x8	35
W–2205	1375	2.62	268	3	10x10	35
W–2505	1700	3.53	355	3½	10x10	40
W–2805	2150	4.36	476	4	12x12	40
W–3105	2650	5.30	608	4	12x12	40
W–1706	750	1.40	140	2½	8x8	35
W–1906	1000	1.88	184	2½	8x8	35
W–2006	1200	2.23	217	3	10x10	35
W–2206	1450	2.62	268	3	10x10	40
W–2506	1825	3.53	355	3½	10x10	40
W–2806	2325	4.36	476	4	12x12	45
W–3106	2825	5.30	608	4	12x12	45

*Water boilers have two outlets and two inlets.

Equipment

FIRING TOOLS:—Slice Bar, Flue Brush and Handle, Scraper.



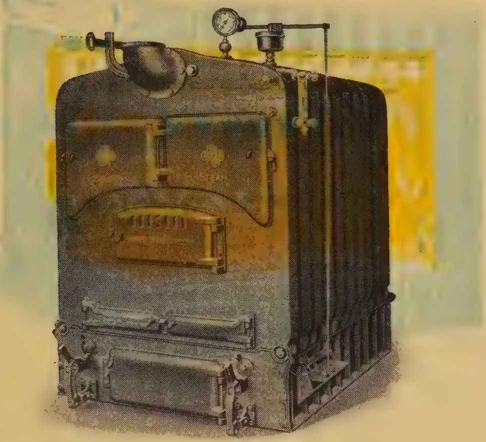
Water Boiler Dimensions

Measurements are in inches

No.	A	D	I	P	S	V	B	R	X
W–1704	24⅝	24¾	16⅜	8	21½	21¾	47⅛	54⅜	18⅛
W–1904	27	23⅜	16¼	8	20⅜	24⅛	45⅞	52⅝	19¼
W–2004	28⅞	23⅜	16¼	8	20½	25½	45½	52	20⅝
W–2204	30⅛	24⅜	16⅞	9	21¼	27⅝	47⅝	55⅝	23
W–2504	33⅛	25¼	17	9	22	30⅛	48¾	56¼	25½
W–2804	36¾	26¼	17⅝	10	23⅛	34⅛	50¾	59½	29⅜
W–3104	39⅛	27⅜	16¾	10	23⅞	36⅞	53⅛	61⅝	32¼
W–1705	24⅝	24¾	16⅜	8	21½	21¾	51⅝	58⅞	18⅛
W–1905	27	23⅜	16¼	8	20⅜	24⅛	50⅜	57⅛	19¼
W–2005	28⅞	23⅜	16¼	8	20½	25½	50⅛	56⅝	20⅝
W–2205	30⅛	24⅜	16⅞	9	21¼	27⅝	52	60	23
W–2505	33⅛	25¼	17	9	22	30⅛	53½	61	25½
W–2805	36¾	26¼	17⅝	10	23⅛	34⅛	55¾	64½	29⅜
W–3105	39⅛	27⅜	16¾	10	23⅞	36⅞	58¼	66¾	32¼
W–1706	24⅝	24¾	16⅜	8	21½	21¾	56¼	63½	18⅛
W–1906	27	23⅜	16¼	8	20⅜	24⅛	55	61¾	19¼
W–2005	28⅞	23⅜	16¼	8	20½	25½	54¾	61¼	20⅝
W–2206	30⅛	24⅜	16⅞	9	21¼	27⅝	56⅞	64⅞	23
W–2506	33⅛	25¼	17	9	22	30⅛	58⅝	66⅛	25½
W–2806	36¾	26¼	17⅝	10	23⅛	34⅛	60⅞	69⅝	29⅜
W–3106	39⅛	27⅜	16¾	10	23⅞	36⅞	63¾	72¼	32¼

For prices see current Trade Discount Sheet.

IDEAL WATER TUBE BOILER



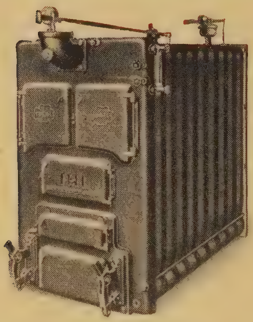
36-Inch Series

Burns all Kinds of Fuel.

Steam Capacity—600 to 17,750 sq. ft.
Water Capacity—975 to 28,500 sq. ft.

SERVICE in well-known residences, apartment houses, churches, hotels, clubs, stores and public buildings in all parts of the country, has identified the IDEAL Water Tube Boiler as one of the best adapted and most efficient boilers for this particular field.

It responds quickly to heating needs, and operates with high efficiency with normal attendance. No special operating skill is required. It serves dependably during the life of any building, and being especially suited for battery installation, provides a highly efficient and de-



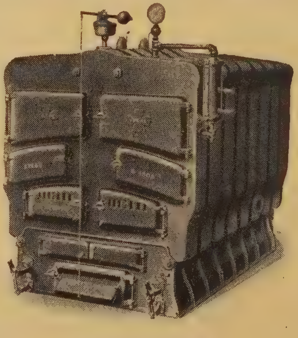
23 and 29-Inch Series

sirable heating equipment for buildings of any size.

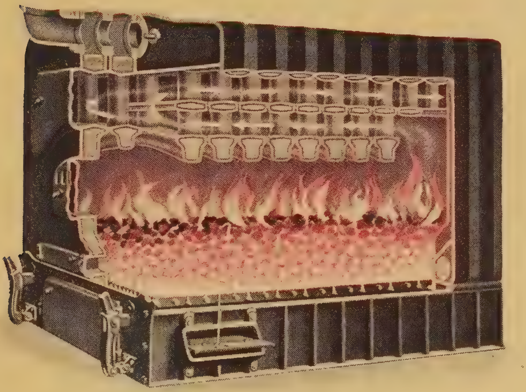
One of the outstanding features effecting the quick heating response and the economical operation of the IDEAL Water Tube Boiler is its extensive array of water-backed vertical tubes. These tubes intercept the horizontal flow of the hot gases in the upper and lower flue galleries, and divide the water in the boiler into many thin streams. As the water becomes heated, it rises through the vertical tubes, establishing a flow at right angles to the movement of the gases.

The long travel of the hot gases and the relation of their direction of flow to that of the water effects a rapid heat transmission. Quick, economical heating is the result. The waterways in the boiler are smooth, and the steam disengaging area is large. Dry steam at the outlet is insured.

Upper and lower flue galleries and fire chamber are separated from one another by the gas-tight junctions formed by the sections' iron-to-iron contact surfaces. This special construction—an exclusive feature in IDEAL Boilers—is secured by grinding



48-Inch Series



Flue Travel of 36-Inch Series

down, with special machinery, the contact surfaces of each section. When the sections are assembled, therefore, a permanent, gas-tight construction is formed.

The result of this construction is that the hot gases are obliged to travel through the entire length of the flue galleries; forward through the lower gallery, then upward and backward through the upper gallery—a distance twice the length of the boiler. They cannot short-circuit to the smokehood from any point. Thus a long, close rubbing-contact between the gases and heat-absorbing surface is secured, and permanent operating economy is insured.

23-Inch Series Ratings and Data

Steam

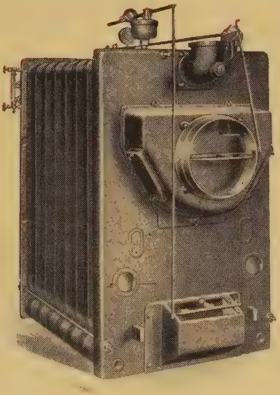
Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Fuel capacity Lbs.	Total Length "L" Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Inches	Chimney Height Feet
S-2305	600	2.72	164	21	1–4	2–3	8x12	30
S-2306	750	3.36	203	25	1–4	2–3	8x12	35
S-2307	900	4.00	242	29	1–4	2–3	8x12	35
S-2308	1050	4.64	281	33	1–4	2–3	12x12	35
S-2309	1200	5.28	320	37	1–4	2–3	12x12	35

Safety Valve Sizes accord with A. S. M. E. boiler code.

Water

Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Fuel capacity Lbs.	Total Length L Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Inches	Chimney Height Feet
W-2305	975	2.72	164	21	1–4	2–3	8x12	30
W-2306	1200	3.36	203	25	1–4	2–3	8x12	35
W-2307	1425	4.00	242	29	1–4	2–3	8x12	35
W-2308	1650	4.64	281	33	1–4	2–3	12x12	35
W-2309	1875	5.28	320	37	1–4	2–3	12x12	35

For prices, see Current Trade Discount Sheet.



29-Inch Series Ratings and Data

Steam

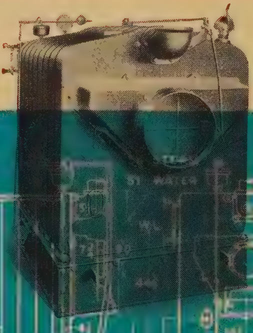
Number of Boiler	Rating Steam Sq. Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
S–2905	1,600	4.84	347	30	1–5	2–4	12x16	35
S–2906	2,000	6.05	435	36	1–5	2–4	12x16	40
S–2907	2,400	7.26	523	42	1–5	2–4	16x16	40
S–2908	2,800	8.47	611	48	1–5	2–4	16x16	45
S–2909	3,200	9.68	699	54	2–5	2–4	16x20	50
S–2910	3,600	10.89	787	60	2–5	2–4	16x20	55
S–2911	4,000	12.10	875	66	2–5	2–4	20x20	60

Safety Valve Sizes accord with A. S. M. E. boiler code.

Water

Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
W-2905	2,600	4.84	347	30	1-5	2-5	12x16	35
W-2906	3,250	6 05	435	36	1-5	2-5	12x16	40
W-2907	3,900	7.26	523	42	2-5	2-5	16x16	40
W-2908	4,550	8.47	611	48	2-5	2-5	16x16	45
W-2909	5,200	9.68	699	54	2-5	2-5	16x20	50
W-2910	5,850	10.89	787	60	2-5	2-5	16x20	55
W-2911	6,500	12.10	875	66	2-5	2-5	20x20	60

For prices, see Current Trade Discount Sheet.



36-Inch Series Ratings and Data

Steam

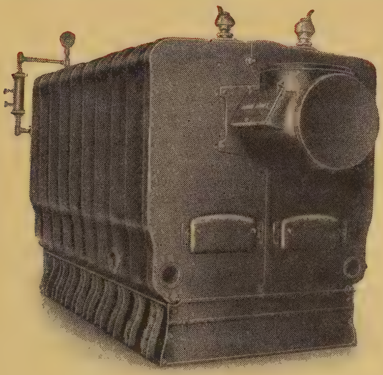
Number of Boiler	Rating Steam Sq. Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
S-3605	2,500	6.00	540	30	1-6	2-4	16x16	45
S-3606	3,150	7.50	684	36	1-6	2-4	16x20	45
S-3607	3,800	9.00	828	42	2-6	2-4	16x20	50
S-3608	4,450	10.50	972	48	2-6	2-4	20x20	50
S-3609	5,100	12.00	1,116	54	2-6	2-4	20x20	55
S-3610	5,750	13.50	1,260	60	2-6	2-4	20x20	55
S-3611	6,400	15.00	1,404	66	2-6	2-4	20x20	60
S-3612	7,050	16.50	1,548	72	2-6	2-4	20x24	60
S-3613	7,700	18.00	1,692	78	2-6	2-4	20x24	65
S-3614	8,350	19.50	1,836	84	2-6	2-4	20x24	70
S-3615	9,000	21.00	1,980	90	2-6	2-4	24x24	75

Safety Valve Sizes accord with A. S. M. E. boiler code

Water

Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
W-3605	4,000	6.00	540	30	1-6	2-4	16x16	45
W-3606	5,100	7.50	684	36	1-6	2-4	16x20	45
W-3607	6,200	9.00	828	42	2-6	*	16x20	50
W-3608	7,300	10.50	972	48	2-6	*	20x20	50
W-3609	8,400	12.00	1,116	54	2-6	*	20x20	55
W-3610	9,500	13.50	1,260	60	2-6	*	20x20	55
W-3611	10,600	15.00	1,404	66	2-6	*	20x20	60
W-3612	11,700	16.50	1,548	72	2-6	†	20x24	60
W-3613	12,800	18.00	1,692	78	2-6	†	20x24	65
W-3614	13,900	19.50	1,836	84	2-6	†	20x24	70
W-3615	15,000	21.00	1,980	90	2-6	†	24x24	75

*Two 3½-in. and two 4-in. †Four 3½-in. and two 4-in.



48-Inch Series Ratings and Data

Steam

Number of Boiler	Rating Steam Sq. Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
S-4806	7,750	18.00	1,475	57¾	2–6	4–4	24x24	65
S-4807	9,000	21.60	1,770	68½	3–6	4–4	24x24	70
S-4808	10,250	25.20	2,065	79¼	3–6	4–4	24x24	75
S-4809	11,500	25.20	2,065	90	3–6	4–4	24x28	80
S-4810	12,750	28.80	2,360	100¾	3–6	4–4	24x28	85
S-4811	14,000	28.80	2,360	111½	4–6	4–4	28x28	95
S-4812	15,250	28.80	2,360	122¼	4–6	4–4	28x28	100
S-4813	16,500	32.40	2,655	133	4–6	4–4	28x32	105
S-4814	17,750	32.40	2,655	143¾	4–6	4–4	28x32	110

Safety Valve Sizes in accord with A. S. M. E. boiler code.

Water

Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
W-4806	12,500	18.00	1,475	57¾	2-6	4-6	24x24	65
W-4807	14,500	21.60	1,770	68½	3-6	4-6	24x24	70
W-4808	16,500	25.20	2,065	79¼	3-6	4-6	24x24	75
W-4809	18,500	25.20	2,065	90	3-6	4-6	24x28	80
W-4810	20,500	28.80	2,360	100¾	3-6	4-6	24x28	85
W-4811	22,500	28.80	2,360	111½	4-6	4-6	28x28	95
W-4812	24,500	28.80	2,360	122¼	4-6	4-6	28x28	100
W-4813	26,500	32.40	2,655	133	4-6	4-6	28x32	105
W-4814	28,500	32.40	2,655	143¾	4-6	4-6	28x32	110

For prices, see Current Trade Discount Sheet.

Dimensions

23-Inch Series

For dimension "L" see page 20

29-Inch Series

For dimension "L" see page 21

For equipment of Water Tube Boilers see page 26

Dimensions

36-Inch Series

For dimension "L" see page 22

48-Inch Series

For dimension "L" see page 23

For equipment of Water Tube Boilers see page 26

Data

23- and 29-Inch Boilers are regularly supplied without Jacket but will be furnished with Ideal Asbestos-lined Metal Jacket on special order.

36- and 48-Inch Boilers are supplied without Jacket.

Boiler Equipment

Steam Boilers

Steam Gauge
Pop-Safety Valve
Water Column and Trimmings
Firing Tools
Arco Automatic Damper Regulator

Water Boilers

Ideal Damper Control
Firing Tools

Chimney Sizes for Boilers in Battery

29-Inch Series

Number of Boiler	Two Boilers			Three Boilers			Four Boilers		
	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet
S or W 2905	3200	16 x 16	40	4800	16 x 20	45	6400	20 x 20	50
S or W 2906	4000	16 x 16	45	6000	16 x 20	45	8000	20 x 20	50
S or W 2907	4800	16 x 20	45	7200	20 x 20	50	9600	20 x 24	55
S or W 2908	5600	16 x 20	50	8400	20 x 20	55	11200	20 x 24	55
S or W 2909	6400	20 x 20	55	9600	20 x 24	60	12800	24 x 24	60
S or W 2910	7200	20 x 20	60	10800	20 x 24	60	14400	24 x 24	60
S or W 2911	8000	20 x 24	65	12000	24 x 24	65	16000	24 x 28	65

Chimney Sizes for Boilers in Battery

36-Inch Series

Number of Boiler	Two Boilers			Three Boilers			Four Boilers			Five Boilers		
	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet
S or W 3605	5000	16 x 20	50	7500	20 x 20	55	10000	20 x 24	60	12500	24 x 24	[illegible]
S or W 3606	6300	20 x 20	50	9450	20 x 24	55	12600	24 x 24	60	15750	24 x 28	65
S or W 3607	7600	20 x 20	55	11400	20 x 24	60	15200	24 x 24	65	19000	24 x 28	70
S or W 3608	8900	20 x 24	55	13350	24 x 24	60	17800	24 x 24	65	22250	28 x 32	70
S or W 3609	10200	20 x 24	60	15300	24 x 24	65	20400	24 x 24	70	25500	28 x 32	75
S or W 3610	11500	24 x 24	60	17250	24 x 28	65	23000	28 x 28	70	28750	28 x 32	75
S or W 3611	12800	24 x 24	65	19200	24 x 28	70	25600	28 x 28	75	32000	28 x 32	80
S or W 3612	14100	24 x 28	70	21150	28 x 28	75	28200	30 x 36	80	35250	30 x 36	[illegible]
S or W 3613	15400	24 x 28	75	23100	28 x 28	80	30800	30 x 36	85	38500	30 x 36	90
S or W 3614	16700	24 x 28	75	25050	28 x 28	80	33400	30 x 36	85	41750	30 x 36	90
S or W 3615	18000	28 x 28	80	27000	30 x 36	85	36000	30 x 36	90	45000	36 x 36	95

48-Inch Series

Number of Boiler	Two Boilers			Three Boilers			Four Boilers			Five Boilers			Six Boilers		
	Rating Steam	Size Ins.	Height Ft.	Rating Steam	Size Ins.	Height Ft.	Rating Steam	Size Ins.	Height Ft.	Rating Steam	Size Ins.	Height Ft.	Rating Steam	Size Ins.	Height Ft.
S or W 4806	15500	28 x 28	65	23250	30 x 36	75	31000	36 x 36	80	38750	36 x 36	85	46500	42 x 42	90
S or W 4807	18000	28 x 28	70	27000	30 x 36	80	36000	36 x 42	85	45000	42 x 42	90	54000	42 x 42	95
S or W 4808	20500	30 x 36	75	30750	36 x 36	85	41000	42 x 42	90	51250	42 x 42	95	61500	42 x 48	100
S or W 4809	23000	30 x 36	80	34500	36 x 42	85	46000	42 x 42	90	57500	42 x 48	95	69000	48 x 48	100
S or W 4810	25500	36 x 36	85	38250	36 x 42	90	51000	42 x 48	95	63750	42 x 48	100	76500	48 x 54	105
S or W 4811	28000	36 x 36	95	42000	42 x 42	95	56000	42 x 48	100	70000	48 x 48	105	84000	54 x 54	110
S or W 4812	30500	36 x 42	100	45750	42 x 42	105	61000	48 x 48	105	76250	48 x 54	110	91500	54 x 54	[illegible]
S or W 4813	33000	42 x 42	105	49500	42 x 48	110	66000	48 x 48	110	82500	48 x 54	115	99000	54 x 60	120
S or W 4814	35500	42 x 42	110	53250	48 x 48	115	71000	48 x 54	115	88750	54 x 54	120	106500	54 x 60	120

Ash-Pit Dimensions

Number of Boiler	Dimensions in Inches			
	Depth	"X"	"Y"	"Z"
S or W-2905	12	24	23	3
S or W-2906	12	30	23	3
S or W-2907	12	36	23	3
S or W-2908	12	42	23	3
S or W-2909	12	48	23	3
S or W-2910	12	54	23	3
S or W-2911	12	60	23	3
S or W-3605	12	24	42	3
S or W-3606	12	30	42	3
S or W-3607	12	36	42	3
S or W-3608	12	42	42	3
S or W-3609	12	48	42	3
S or W-3610	12	54	42	3
S or W-3611	12	60	42	3
S or W-3612	12	66	42	3
S or W-3613	12	72	42	3
S or W-3614	12	78	42	3
S or W-3615	12	84	42	3
S or W-4806	12	52	50	2
S or W-4807	12	63	50	2
S or W-4808	12	73	50	2
S or W-4809	12	73	50	14
S or W-4810	12	83	50	14
S or W-4811	12	83	50	24
S or W-4812	12	83	50	35
S or W-4813	12	94	50	35
S or W-4814	12	94	50	46

Arrangement of Sections

23-INCH SERIES

Steam or Water

A—Front Section
C—Center Section
H—Back Section
U—Rear Center (Uptake)

Boiler Number	Arrangement
S-2305 or W-2305	A-2C-U-H
S-2306 or W-2306	A-3C-U-H
S-2307 or W-2307	A-4C-U-H
S-2308 or W-2308	A-5C-U-H
S-2309 or W-2309	A-6C-U-H

29-INCH SERIES

Steam or Water

A—Front Section
C—Center Section
U—Rear Center Uptake
H—Back Section

Boiler Number	Arrangement
S-2905 or W-2905	A-2C-U-H
S-2906 or W-2906	A-3C-U-H
S-2907 or W-2907	A-4C-U-H
S-2908 or W-2908	A-5C-U-H
S-2909 or W-2909	A-6C-U-H
S-2910 or W-2910	A-7C-U-H
S-2911 or W-2911	A-8C-U-H

36-INCH SERIES

A—Front Section
B—Front Center Section
C—Center Section
D—Center Connecting (Return only)
U—Rear Center (Uptake)
H—Back Section

Steam		Water	
Boiler Number	Arrangement	Boiler Number	Arrangement
S-3605	A-2C-U-H	W-3605	A-2C-U-H
S-3606	A-3C-U-H	W-3606	A-3C-U-H
S-3607	A-4C-U-H	W-3607	A-3C-D-U-H
S-3608	A-5C-U-H	W-3608	A-3C-D-C-U-H
S-3609	A-6C-U-H	W-3609	A-3C-D-2C-U-H
S-3610	A-7C-U-H	W-3610	A-3C-D-3C-U-H
S-3611	A-8C-U-H	W-3611	A-3C-D-4C-U-H
S-3612	A-B-8C-U-H	W-3612	A-B-2C-D-2C-D-2C-U-H
S-3613	A-B-8C-2U-H	W-3613	A-B-2C-D-2C-D-2C-2U-H
S-3614	A-B-9C-2U-H	W-3614	A-B-2C-D-2C-D-3C-2U-H
S-3615	A-B-10C-2U-H	W-3615	A-B-2C-D-2C-D-4C-2U-H

Arrangement of Sections

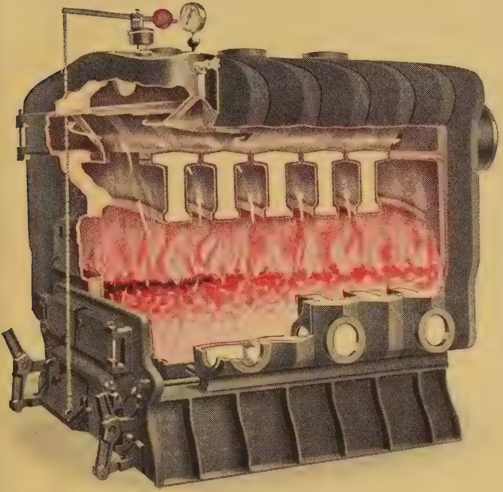
48-INCH SERIES

Steam or Water

A —Front Section
K —Closed Front Flue
CX —Closed Front Flue Connecting (Supply Only)
F —Closed Center Section
NX —Closed Center Connecting (Supply Only)
U —Open Rear Center
MX—Open Rear Center Connecting (Return Only)
GX —Open Rear Center Connecting (Supply and Return)
I —Open Back

No. of Boiler S or W	Arrangement	
	Left Hand Side	Right Hand Side
4806	A-CX-F-F-GX-I	A-K-F-F-MX-I
4807	A-CX-F-NX-F-GX-I	A-K-F-F-F-MX-I
4808	A-CX-F-F-NX-F-GX-I	A-K-F-F-F-F-MX-I
4809	A-CX-F-F-NX-F-GX-U-I	A-K-F-F-F-F-MX-U-I
4810	A-CX-F-F-NX-F-F-GX-U-I	A-K-F-F-F-F-F-MX-U-I
4811	A-CX-F-NX-F-NX-F-F-GX U-I	A-K-F-F-F-F-F-F-MX-U-I
4812	A-CX-F-NX-F-F-NX-F-U-GX-U-I	A-K-F-F-F-F-F-F-U-MX-U-I
4813	A-CX-F-F-NX-F-F-NX-F-U-GX-U-I	A-K-F-F-F-F-F-F-F-U-MX-U-I
4814	A-CX-F-F-NX-F-F-NX-F-F-U-GX-U-I	A-K-F-F-F-F-F-F-F-F-U-MX-U-I

IDEAL SECTIONAL BOILER

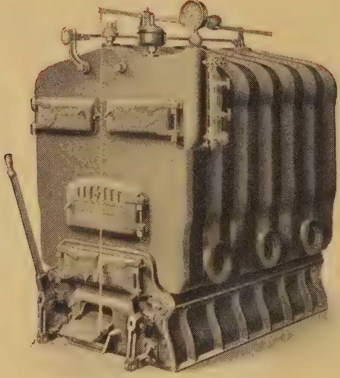


Burns All Kinds of Fuel

Steam Capacity— 600 to 2275 sq. ft.
Water Capacity—1000 to 3725 sq. ft.

IN MANY districts throughout the country, the Ideal Sectional Boiler is especially favored by architects, engineers and heating contractors.

It is a sturdy, absolutely dependable boiler, worthy in every respect of the excellent reputation it has earned through its many years of service.



Steam Boiler Ratings and Data

Number of Boiler	Ratings Sq. Ft.	Grate Area, Sq. Ft.	Total Length "L" Inches	Hard Coal Fuel Cap. Lbs.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Ht. Ft.
S-19-5	600	3.32	30½	188	2-3	4-3	8x12	35
S-19-6	750	4.15	37⅛	236	2-3	4-3	8x12	35
S-19-7	900	4.98	43¾	283	3-3	6-3	8x12	35
S-22-5	800	4.08	32 15/16	252	2-4	4-4	8x12	35
S-22-6	1000	5.10	40	315	2-4	4-4	8x12	35
S-22-7	1200	6.12	47 1/16	377	3-4	6-4	8x12	40
S-25-5	1100	5.44	35⅜	396	2-4	4-4	8x12	40
S-25-6	1350	6.80	43 1/16	425	2-4	4-4	8x12	40
S-25-7	1600	8.16	50¾	503	3-4	6-4	12x12	40
S-25-8	1850	9.52	58 7/16	582	3-4	6-4	12x12	45
S-28-5	1300	6.24	36¼	398	2-4	4-4	12x12	40
S-28-6	1625	7.80	44¼	500	2-4	4-4	12x12	40
S-28-7	1950	9.36	52¼	598	3-4	6-4	12x16	40
S-28-8	2275	10.92	60¼	697	3-4	6-4	12x16	45

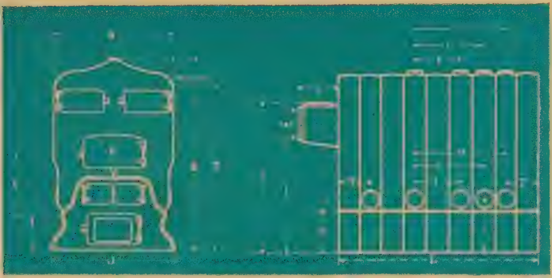
*Safety valve sizes accord with A. S. M. E. boiler code.

For prices, see Current Trade Discount Sheet.

Equipment

TRIMMINGS.—Safety Valves and Steam Gauge are supplied with all Steam Boilers.

FIRE TOOLS:—Flue Brush and Handle, Poker, Slice Bar and Hoe are supplied with all Boilers.



For Dimension "L" see page 32

Steam Boiler Measurements

	19-in.	22-in.	25-in.	28-in.
A.......	32¼	36¼	41⅜	44½
B.......	50	53	57⅞	60⅝
†C.......	15⅝	15¼	17½	18⅛
‡D.......	45⅛	47¾	53	55⅞
E.......	37¾	40½	44⅛	46¼
F.......	13¼	14⅛	15⅜	16
G.......	19⅞	21¼	23 1/16	24
H.......	26½	28¼	30¾	32
I.......	16	16¾	17¾	17⅞
J.......	26	29⅛	34½	37⅛
K.......	§8x14	§8x14	§9x18	§9x18
M.......	43⅜	46¼	51	53⅜
N.......	9⅜	9½	9⅞	10
P.......	9	10	11	12
S.......	12⅝	12⅜	14¼	14¼
T.......	8	8½	9⅛	9½
V.......	29⅝	33 9/16	39⅜	41 13/16

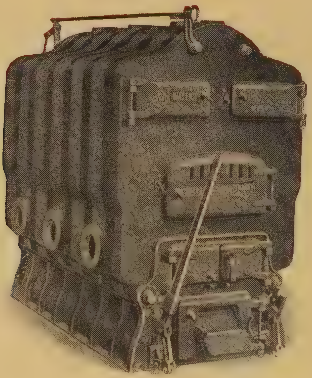
†Measured without Smoke-Hood Cover.

‡Measured with Smoke-Hood Cover on.

§For Wood, Feed Door K in 19-inch Boilers is 10¼x18 inches; in 22-inch Boilers is 11⅛x18 inches; in 25-inch Boilers is 11⅛x18 inches; in 28-inch Boilers is 12 13/16x19⅞ inches.

Do not bush the flow-pipe outlets of Steam Boilers; connect full size to the main.

For Arrangement of Sections see page 36.



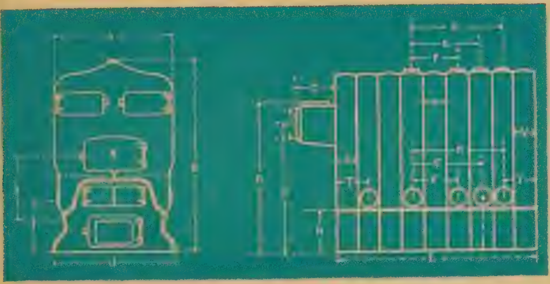
Water Boiler Ratings and Data

Number of Boiler	Ratings Sq. Ft.	Grate Area, Sq. Ft.	Total Length "L" Inches	Hard Coal Cap. Lbs.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
W-19-5	1000	3.32	$30\frac{1}{2}$	188	2-3	4-3	8x12	35
W-19-6	1250	4.15	$37\frac{1}{8}$	236	2-3	4-3	8x12	35
W-19-7	1500	4.98	$43\frac{3}{4}$	283	3-3	6-3	8x12	35
W-22-5	1300	4.08	$32\frac{15}{16}$	252	2-4	4-4	8x12	35
W-22-6	1650	5.10	40	315	2-4	4-4	8x12	35
W-22-7	2000	6.12	$47\frac{1}{16}$	377	3-4	6-4	8x12	40
W-25-5	1825	5.44	$35\frac{3}{8}$	346	2-4	4-4	8x12	40
W-25-6	2225	6.80	$43\frac{1}{16}$	425	2-4	4-4	8x12	40
W-25-7	2650	8.16	$50\frac{3}{4}$	503	3-4	6-4	12x12	40
W-25-8	3050	9.52	$58\frac{7}{16}$	582	3-4	6-4	12x12	45
W-28-5	2150	6.24	$36\frac{1}{4}$	398	2-4	4-4	12x12	40
W-28-6	2675	7.80	$44\frac{1}{4}$	500	2-4	4-4	12x12	40
W-28-7	3200	9.36	$52\frac{1}{4}$	598	3-4	6-4	12x16	40
W-28-8	3725	10.92	$60\frac{1}{4}$	697	3-4	6-4	12x16	45

For prices, see Current Trade Discount Sheet.

EQUIPMENT

FIRE TOOLS:—Flue Brush and Handle, Poker, Slice Bar and Hoe are supplied with all Boilers.



For dimension "L" see page 34

Water Boiler Measurements

	19-in.	22-in.	25-in.	28-in.
A.......	31¼	35¼	40⅜	43½
B.......	50	53	57⅞	60⅝
†C.......	15⅝	15¼	17½	18⅛
‡D.......	45⅛	47¾	53	55⅞
E.......	37¾	40½	44⅛	46¼
F.......	13¼	14⅛	15⅜	16
G.......	19⅞	21¼	23 1/16	24
H.......	26½	28¼	30¾	32
I.......	16	16¾	17¾	17⅞
J.......	26	29⅛	34½	37⅛
K.......	§8x14	§8x14	§9x18	§9x18
M.......	....	....	....	....
N.......	9⅜	9½	9⅞	10
P.......	9	10	11	12
S.......	12⅝	12⅜	14¼	14¼
T.......	8	8½	9⅛	9½
V.......	29⅝	33 9/16	39⅜	41 3/16

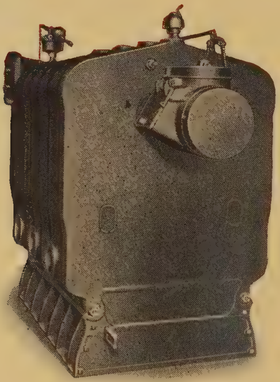
†Measured without Smoke-Hood Cover.

‡Measured with Smoke-Hood Cover on.

§For Wood, Feed Door K in 19-inch Boilers is 10¼x18 inches; in 22-inch Boilers is 11⅛x18 inches; in 25-inch Boilers is 11⅛x18 inches; in 28-inch Boilers is 12 13/16x19 ⅞ inches.

Do not bush the flow-pipe outlets of Steam Boilers; connect full size to the main.

For arrangement of Sections see page 36.

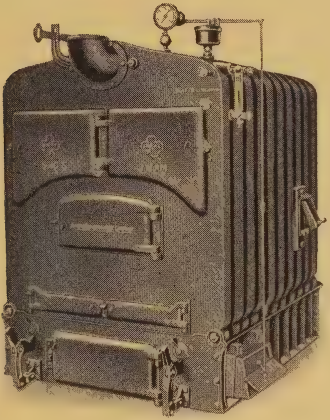


Arrangement of Sections
19, 22, 25 and 28-inch Series

A—Front Section; B—Back Section; E—Open Center; F—Closed Center; G—Open Connecting; H—Closed Connecting; J—Rear Center Connecting.

STEAM	WATER
S-19-5—A-G-E-J-B	W-19-5—A-G-E-J-B
S-19-6—A-G-E-E-J-B	W-19-6—A-G-E-E-J-B
S-19-7—A-G-E-G-E-J-B	W-19-7—A-G-E-G-E-J-B
S-22-5—A-G-E-J-B	W-22-5—A-G-E-J-B
S-22-6—A-G-E-E-J-B	W-22-6—A-G-E-E-J-B
S-22-7—A-G-E-G-E-J-B	W-22-7—A-G-E-G-E-J-B
S-25-5—A-G-E-J-B	W-25-5—A-G-E-J-B
S-25-6—A-H-E-E-J-B	W-25-6—A-H-E-E-J-B
S-25-7—A-H-F-G-E-J-B	W-25-7—A-H-F-G-E-J-B
S-25-8—A-H-F-F-G-E-J-B	W-25-8—A-H-F-F-G-E-J-B
S-28-5—A-G-E-J-B	W-28-5—A-G-E-J-B
S-28-6—A-H-E-E-J-B	W-28-6—A-H-E-E-J-B
S-28-7—A-H-F-G-E-J-B	W-28-7—A-H-F-G-E-J-B
S-28-8—A-H-F-F-G-E-J-B	W-28-8—A-H-F-F-G-E-J-B

IDEAL SMOKELESS BOILER

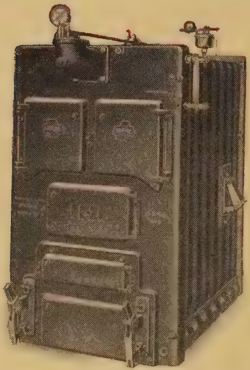


Burns Soft Coal Smokelessly.

Steam Capacity—2000 to 17,750 sq. ft.
Water Capacity—3250 to 28,500 sq. ft.

ONE of the most persistent and clearly defined demands expressed during the last few years has been for a smokeless boiler for residences, apartments, schools, theatres and other buildings —a boiler easily cared for, efficient and attractive in price.

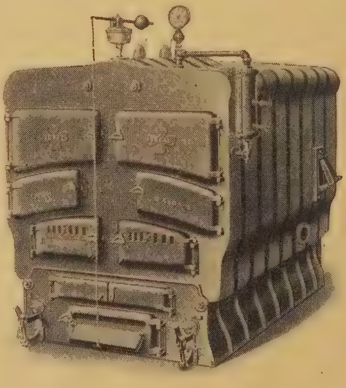
To meet this demand various types of boilers were produced, one improving upon the other, each playing a helpful part in establishing the basis for a nearer approach to the ideal.



29-Inch Series

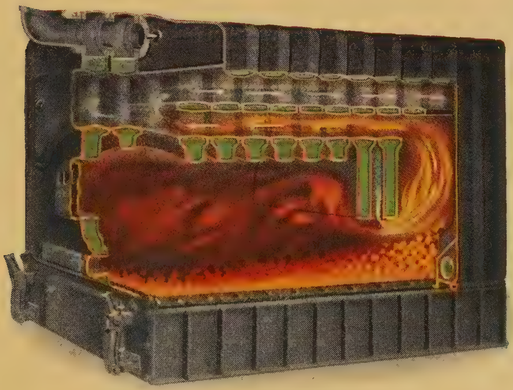
The American Radiator Company resolved to produce the one smokeless boiler which would embody every desirable feature in the highest degree. Its thermal research laboratory conducted intensive tests along every phase of the problem, and has succeeded in perfecting the IDEAL Smokeless Boiler.

The IDEAL Smokeless Boiler achieves a new record in smoke abatement to the extent that it not only complies with the most rigid city smoke ordinances, but sets a new standard in fuel economy for this type of boiler. Its performance from the viewpoint of fuel economy alone, will recommend it universally.



48-Inch Series

And it is important to note that the smokeless performance, the economy of operation and dependability of service of the



Cutaway View of 36-Inch Series

Internal view of the IDEAL Smokeless Boiler, showing how the Ideal Smoke Oxidizer operates.

It is feeding a supply of fresh air in fine, uniform streams to the smoke-laden volatile matter distilled from the bed of soft coal. A thorough, compressed mixture of air and volatile matter is effected, which is ignited instantaneously by the glowing coals at the base of the Mixing Channel. This mixture bursts into flame in the rear gas chamber at an intensely high temperature, completely burning the smoke-making particles.

IDEAL Smokeless Boiler, are not dependent upon any trick-work on the part of the operator. No special skill is required of the attendant to secure best results at all times.

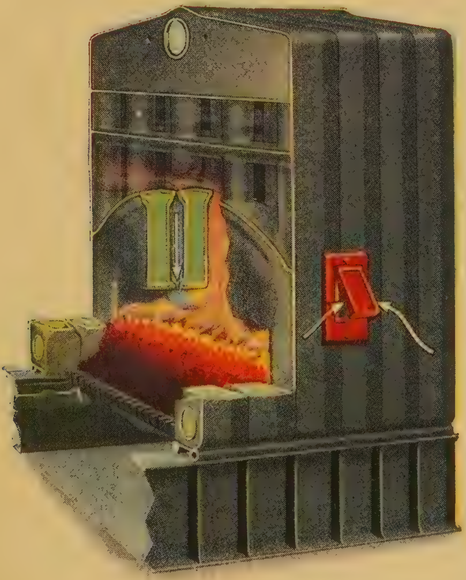
The boiler accomplishes its record performance by means of its special IDEAL Smoke Oxidizer—a newly perfected device for supplying fresh air (oxygen) to the volatile matter distilled from the coal, in which is suspended the smoke-producing

A close-up View of the
IDEAL Smoke Oxidizer

particles of carbon. This device is scientifically proportioned to induct and distribute fresh air in fine, uniform streams over a bed of glowing coals, where it meets and mixes with the volatile matter. A perfect mixture is effected which ignites and burns at an exceedingly high temperature—thus entirely consuming, within the boiler, the smoke-producing particles. In this way, smoking at the chimney top is not only prevented, but the heat value of the smoke is converted into practical service.

The IDEAL Smoke Oxidizer is an integral and indestructible part of the boiler. It eliminates the need of brick linings and all other accessories, which are not only troublesome to install, but are a source of constant repair bills to the owner.

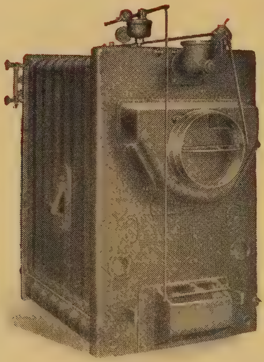
The sectional view of this boiler illustrates the operation of the IDEAL Smoke Oxidizer and shows the long, double gallery of flue passageways. These galleries are separated from each other by leak-proof, machine-ground, iron-to-iron contact surfaces. The hot gases, there-



Detail of IDEAL Smoke Oxidizer

fore are forced to travel the entire flue course. Permanent economy is insured.

The Ideal Smokeless Boiler has not only established a higher standard of economy in fuel consumption and non-smoking performance; it has accomplished this with a simplified design and construction. There is nothing to burn out. With normal attention efficient, dependable heating and smokeless operation are insured.



29-Inch Series Ratings and Data

Steam

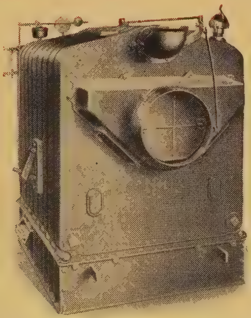
Number of Boiler	Rating Steam Sq. Ft.	Grate Area Sq. Ft.	Total Length "L" Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Ins.	Chimney Height Ft.
S–2906–S	2,000	6.05	36	1–5	2–4	12x16	40
S–2907–S	2,400	7.26	42	1–5	2–4	16x16	40
S–2908–S	2,800	8.47	48	1–5	2–4	16x16	45
S–2909–S	3,200	9.68	54	2–5	2–4	16x20	50
S–2910–S	3,600	10.89	60	2–5	2–4	16x20	55
S–2911–S	4,000	12.10	66	2–5	2–4	20x20	60

Safety Valves accord with A. S. M. E. boiler code.

Water

Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Total Length "L" Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Ins.	Chimney Height Ft.
W–2906–S	3,250	6.05	36	1–5	2–5	12x16	40
W–2907–S	3,900	7.26	42	2–5	2–5	16x16	40
W–2908–S	4,550	8.47	48	2–5	2–5	16x16	45
W–2909–S	5,200	9.68	54	2–5	2–5	16x20	50
W–2910–S	5,850	10.89	60	2–5	2–5	16x20	55
W–2911–S	6,500	12.10	66	2–5	2–5	20x20	60

For prices, see Current Trade Discount Sheet.



36-Inch Series Ratings and Data

Steam

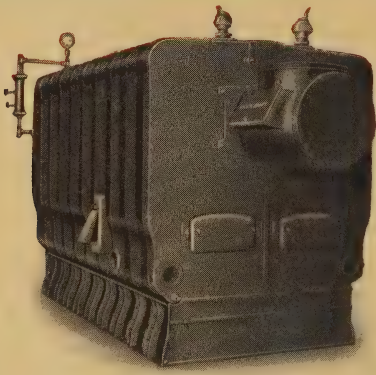
Number of Boiler	Rating Steam Sq. Ft.	Grate Area Sq. Ft.	Total Length "L" Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Ins.	Chimney Height Ft.
S–3607–S	3,800	9.00	42	2–6	2–4	16x20	50
S–3608–S	4,450	10.50	48	2–6	2–4	20x20	50
S–3609–S	5,100	12.00	54	2–6	2–4	20x20	55
S–3610–S	5,750	13.50	60	2–6	2–4	20x20	55
S–3611–S	6,400	15.00	66	2–6	2–4	20x20	60
S–3612–S	7,050	16.50	72	2–6	2–4	20x24	60
S–3613–S	7,700	18.00	78	2–6	2–4	20x24	65
S–3614–S	8,350	19.50	84	2–6	2–4	20x24	70
S–3615–S	9,000	21.00	90	2–6	2–4	24x24	75

Safety Valves accord with A. S. M. E. boiler code.

Water

Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Total Length "L" Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Ins.	Chimney Height Ft.
W–3607–S	6,200	9.00	42	2–6	*	16x20	50
W–3608–S	7,300	10.50	48	2–6	*	20x20	50
W–3609–S	8,400	12.00	54	2–6	*	20x20	55
W–3610–S	9,500	13.50	60	2–6	*	20x20	55
W–3611–S	10,600	15.00	66	2–6	*	20x20	60
W–3612–S	11,700	16.50	72	2–6	†	20x24	60
W–3613–S	12,800	18.00	78	2–6	†	20x24	65
W–3614–S	13,900	19.50	84	2–6	†	20x24	70
W–3615–S	15,000	21.00	90	2–6	†	24x24	75

*Two 3½-in. and two 4-in.
†Four 3½-in. and two 4-in.



48-Inch Series Ratings and Data

Steam

Number of Boiler	Rating Steam Sq. Ft.	Grate Area Sq. Ft.	Total Length "L" Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Ins.	Chimney Height Ft.
S–4807–S	9,000	21.60	68 ½	3–6	4–4	24x24	70
S–4808–S	10,250	25.20	79 ¼	3–6	4–4	24x24	75
S–4809–S	11,500	25.20	90	3–6	4–4	24x28	80
S–4810–S	12,750	28.80	100 ¾	3–6	4–4	24x28	85
S–4811–S	14,000	28.80	111 ½	4–6	4–4	28x28	95
S–4812–S	15,250	28.80	122 ¼	4–6	4–4	28x28	100
S–4813–S	16,500	32.40	133	4–6	4–4	28x32	105
S–4814–S	17,750	32.40	143 ¾	4–6	4–4	28x32	110

Safety Valves accord with A. S. M. E. boiler code.

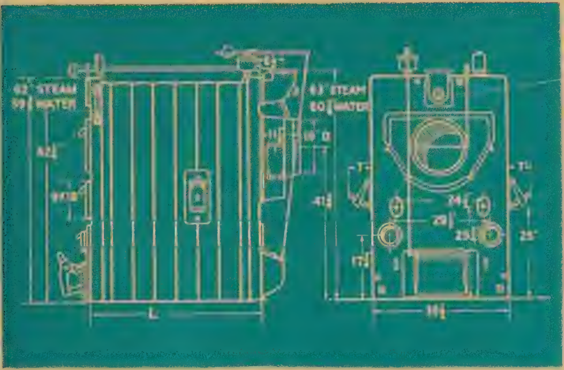
Water

Number of Boiler	Rating Water Sq. Ft.	Grate Area Sq. Ft.	Total Length "L" Ins.	Outlets Number and Size	Inlets Number and Size	Chimney Size Ins.	Chimney Height Ft.
W–4807–S	14,500	21.60	68 ½	3–6	4–6	24x24	70
W–4808–S	16,500	25.20	79 ¼	3–6	4–6	24x24	75
W–4809–S	18,500	25.20	90	3–6	4–6	24x28	80
W–4810–S	20,500	28.80	100 ¾	3–6	4–6	24x28	85
W–4811–S	22,500	28.80	111 ½	4–6	4–6	28x28	95
W–4812–S	24,500	28.80	122 ¼	4–6	4–6	28x28	100
W–4813–S	26,500	32.40	133	4–6	4–6	28x32	105
W–4814–S	28,500	32.40	143 ¾	4–6	4–6	28x32	110

For prices, see Current Trade Discount Sheet.

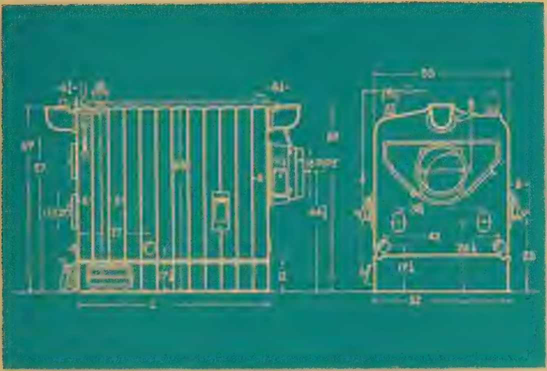
Dimensions

29-Inch Series



For dimension "L" see page 42

36-Inch Series

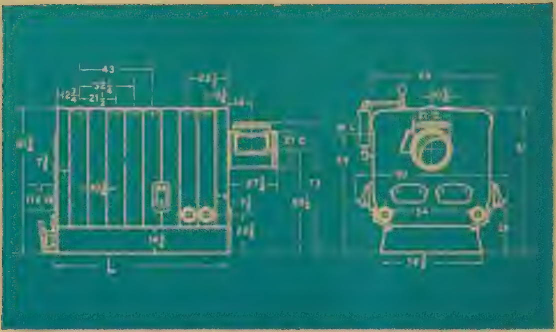


For dimension "L" see page 43

For equipment of Smokeless Boilers see page 46

Dimensions

48-Inch Series



For dimension "L" see page 44

Data

29-Inch Boilers are regularly supplied without jacket but will be furnished with Ideal Asbestos-lined Metal Jacket on special order.

36- and 48-Inch Boilers are supplied without Jacket.

Boiler Equipment

Steam Boilers

Steam Gauge — Pop-Safety Valve

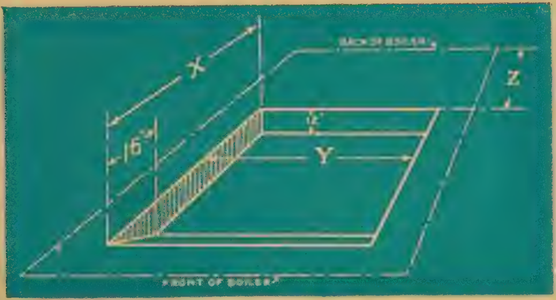
Water Column and Trimmings

Firing Tools

Arco Automatic Steam Regulator

Water Boilers

Ideal Damper Control — Firing Tools



Ash-Pit Dimensions

Number of Boiler	Dimensions Inches			
	Depth	"X"	"Y"	"Z"
S or W-2906-S.	12	30	23	3
S or W-2907-S.	12	36	23	3
S or W-2908-S.	12	42	23	3
S or W-2909-S.	12	48	23	3
S or W-2910-S.	12	54	23	3
S or W-2911-S.	12	60	23	3
S or W-3607-S.	12	36	42	3
S or W-3608-S.	12	42	42	3
S or W-3609-S.	12	48	42	3
S or W-3610-S.	12	54	42	3
S or W-3611-S.	12	60	42	3
S or W-3612-S.	12	66	42	3
S or W-3613-S.	12	72	42	3
S or W-3614-S.	12	78	42	3
S or W-3615-S.	12	84	42	3
S or W-4807-S.	12	63	50	Z
S or W-4808-S.	12	73	50	Z
S or W-4809-S.	12	73	50	14
S or W-4810-S.	12	83	50	14
S or W-4811-S.	12	83	50	24
S oı W-4812-S.	12	83	50	35
S or W-4813-S.	12	94	50	35
S or W-4814-S.	12	94	50	46

Chimney Sizes for Boilers in Battery

29-Inch Series

Number of Boiler	Two Boilers			Three Boilers			Four Boilers		
	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet
S or W 2906-S	4000	16 x 16	45	6000	16 x 20	45	8000	20 x 20	50
S or W 2907-S	4800	16 x 20	45	7200	20 x 20	50	9600	20 x 24	55
S or W 2908-S	5600	16 x 20	50	8400	20 x 20	55	11200	20 x 24	55
S or W 2909-S	6400	20 x 20	55	9600	20 x 24	60	12800	24 x 24	60
S or W 2910-S	7200	20 x 20	60	10800	20 x 24	60	14400	24 x 24	60
S or W 2911-S	8000	20 x 24	65	12000	24 x 24	65	16000	24 x 28	65

36-Inch Series

Number of Boiler	Two Boilers			Three Boilers			Four Boilers			Five Boilers		
	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet
S or W 3607-S	7600	20 x 20	55	11400	20 x 24	60	15200	24 x 24	65	19000	24 x 28	70
S or W 3608-S	8900	20 x 24	55	13350	24 x 24	60	17800	24 x 24	65	22250	28 x 32	70
S or W 3609-S	10200	20 x 24	60	15300	24 x 24	65	20400	24 x 24	70	25500	28 x 32	75
S or W 3610-S	11500	24 x 24	60	17250	24 x 28	65	23000	28 x 28	70	28750	28 x 32	75
S or W 3611-S	12800	24 x 24	65	19200	24 x 28	70	25600	28 x 28	75	32000	28 x 32	80
S or W 3612-S	14100	24 x 28	70	21150	28 x 28	75	28200	30 x 36	80	35250	30 x 36	85
S or W 3613-S	15400	24 x 28	75	23100	28 x 28	80	30800	30 x 36	85	38500	30 x 36	90
S or W 3614-S	16700	24 x 28	75	25050	28 x 28	80	33400	30 x 36	85	41750	30 x 36	90
S or W 3615-S	18000	28 x 28	80	27000	30 x 36	85	36000	30 x 36	90	45000	36 x 36	95

48-Inch Series

Number of Boiler	Two Boilers			Three Boilers			Four Boilers			Five Boilers			Six Boilers		
	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet	Rating Steam	Size Inches	Height Feet
S or W 4807-S	18000	28 x 32	70	27000	30 x 36	80	36000	36 x 42	85	45000	42 x 42	90	54000	42 x 42	95
S or W 4808-S	20500	28 x 32	75	30750	30 x 36	85	41000	36 x 42	90	51250	42 x 42	95	61500	42 x 42	100
S or W 4809-S	23000	30 x 36	80	34500	36 x 36	85	46000	42 x 42	90	57500	42 x 48	95	69000	42 x 48	100
S or W 4810-S	25500	30 x 36	85	38250	36 x 36	90	51000	42 x 42	95	63750	42 x 48	100	76500	42 x 48	105
S or W 4811-S	28000	36 x 36	95	42000	36 x 42	95	56000	42 x 48	100	70000	48 x 48	105	84000	48 x 48	110
S or W 4812-S	30500	36 x 36	100	45750	36 x 42	105	61000	42 x 48	105	76250	48 x 48	110	91500	48 x 48	115
S or W 4813-S	33000	36 x 36	105	49500	42 x 42	110	66000	42 x 48	110	82500	48 x 54	115	99000	54 x 54	120
S or W 4814-S	35500	36 x 36	110	53250	42 x 42	115	71000	48 x 48	115	88750	48 x 54	120	106500	54 x 54	120

Arrangement of Sections

29-Inch Series

Steam or Water

A —Front Section
C —Center Section
FA—Front Auxiliary Air Section
RA—Rear Auxiliary Air Section (closed uptake)
OA—Rear Auxiliary Air Section (open uptake)
U —Rear Center Uptake
H—Back Section

Boiler Number	Arrangement
S-2906-S or W-2906-S	A-2C-FA-OA-H
S-2907-S or W-2907-S	A-3C-FA-OA-H
S-2908-S or W-2908-S	A-3C-FA-RA-U-H
S-2909-S or W-2909-S	A-4C-FA-RA-U-H
S-2910-S or W-2910-S	A-5C-FA-RA-U-H
S-2911-S or W-2911-S	A-6C-FA-RA-U-H

36-Inch Series

A —Front Section
B —Front Center Section
C —Center Section
D —Center Connecting Section (Return Only)
FA—Front Auxiliary Air Section
RA—Rear Auxiliary Air Section (closed uptake)
OA—Rear Auxiliary Air Section (open uptake)
U —Rear Center Uptake
H —Back Section

Steam

Boiler Number	Arrangement
S-3607-S	A-3C-FA-OA-H
S-3608-S	A-4C-FA-OA-H
S-3609-S	A-4C-FA-RA-U-H
S-3610-S	A-5C-FA-RA-U-H
S-3611-S	A-6C-FA-RA-U-H
S-3612-S	A-B-6C-FA-RA-U-H
S-3613-S	A-B-6C-FA-RA-2U-H
S-3614-S	A-B-7C-FA-RA-2U-H
S-3615-S	A-B-8C-FA-RA-2U-H

Water

Boiler Number	Arrangement
W-3607-S	A-2C-D-FA-OA-H
W-3608-S	A-3C-D-FA-OA-H
W-3609-S	A-3C-D-FA-RA-U-H
W-3610-S	A-3C-D-C-FA-RA-U-H
W-3611-S	A-3C-D-2C-FA-RA-U-H
W-3612-S	A-B-2C-D-2C-D-FA-RA-U-H
W-3613-S	A-B-2C-D-2C-D-FA-RA-2U-H
W-3614-S	A-B-2C-D-2C-D-C-FA-RA-2U-H
W-3615-S	A-B-2C-D-2C-D-2C-FA-RA-2U-H

Arrangement of Sections

48-INCH SERIES

Steam or Water

A —Front Section

K —Closed Front Flue

CX —Closed Front Flue Connecting (Supply Only)

F —Closed Center Section

NX —Closed Center Connecting (Supply Only)

SA —Front Auxiliary Air Section

RA —Rear Auxiliary Air Section

RX —Rear Auxiliary Air Open Uptake Section (Supply and Return)

OX —Rear Auxiliary Air Open Uptake Section (Return Only)

U —Open Rear Center

MX—Open Rear Center Connecting (Return Only)

GX —Open Rear Center Connecting (Supply and Return)

I —Open Back Section

Arrangement

No. of Boiler	Left Hand Side	Right Hand Side
S-or-W-4807-S	A-CX-F-NX-SA-RX-I	A-K-F-F-SA-OX-I
S-or-W-4808-S	A-CX-F-NX-F-SA-RX-I	A-K-F-F-F-SA-OX-I
S-or-W-4809-S	A-CX-F-F-NX-SA-RX-U-I	A-K-F-F-F-SA-OX-U-I
S-or-W-4810-S	A-CX-F-F-NX-F-SA-RX-U-I	A-K-F-F-F-F-SA-OX-U-I
S-or-W-4811-S	A-CX-F-NX-F-NX-SA-RA-GX-U-I	A-K-F-F-F-F-SA-RA-MX-U-I
S-or-W-4812-S	A-CX-F-NX-F-NX-SA-RA-U-GX-U-I	A-K-F-F-F-F-SA-RA-U-MX-U-I
S-or-W-4813-S	A-CX-F-NX-F-F-NX-SA-RA-U-GX-U-I	A-K-F-F-F-F-F-SA-RA-U-MX-U-I
S-or-W-4814-S	A-CX-F-NX-F-F-NX-SA-RA-F-U-GX-U-I	A-K-F-F-F-F-F-SA-RA-F-U-MX-U-I

IDEAL METAL JACKETS

for

IDEAL BOILERS

Section of jacket showing layers of asbestos insulation

IDEAL METAL JACKETS

Save Time, Labor, and Fuel

Ideal Metal Jackets minimize boiler radiation heat loss, facilitate installation and provide neat, clean, economical boiler covers.

A boiler's radiation is practically a constant quantity regardless of the rate at which the boiler is producing. It represents, therefore, a constant heat leakage every minute the boiler is in operation. In the aggregate this loss is a very appreciable quantity.

Being a constant quantity, radiation heat loss is greater, on a percentage basis, when the boiler is producing at normal rate; i. e. 30% to 35% of its capacity, and grows proportionately less as the boiler approaches its maximum production.

To prevent this loss, IDEAL Metal Jackets were designed. The exterior of sheet steel is lined with laminated plies of asbestos, the gauges in each instance being scientifically determined in accordance with the size of the boiler.

The use of an IDEAL Metal Jacket prevents the risk of not applying a sufficiently thick coating of the ordinary cement asbestos and insures a permanently satisfactory boiler covering.

IDEAL Metal Jackets are quickly and easily set in place on the boilers and are as durable as the boilers they serve. By their yearly fuel saving and their durability, they represent a permanent and high interest-bearing investment for house-owners.

The following boilers can be equipped with IDEAL Metal Jackets for a slight additional cost:

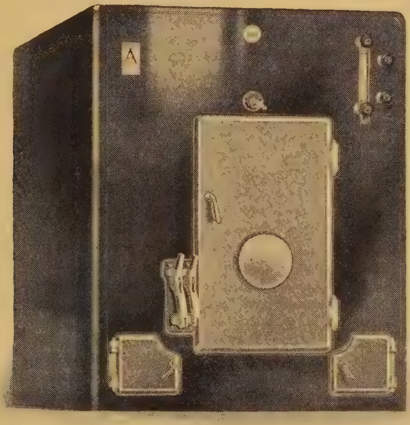
23″ IDEAL Water Tube Boiler

29″ IDEAL Water Tube Boiler

29″ IDEAL Smokeless Boiler

The IDEAL Type "A" Heat Machine is regularly equipped with the IDEAL Metal Jacket.

IDEAL TYPE "A" HEAT MACHINE



Patented Nov. 15, 1921, other Patents Pending.

For hard coal, coke, oil or gas.

Steam capacity—1000 to 6000 sq. ft.

Water capacity—1600 to 9600 sq. ft.

THE IDEAL Type "A" Heat Machine is especially designed for owners of residences, hotels, banks, theaters, and other buildings who want the best that is made.

The Ideal Type "A" Heat Machine is a powerful, dependable heat generator that operates with a saving to the owner of one-third his annual coal bill. This means that it will have paid for its additional cost in approximately three years, thereafter representing a high interest-bearing investment.

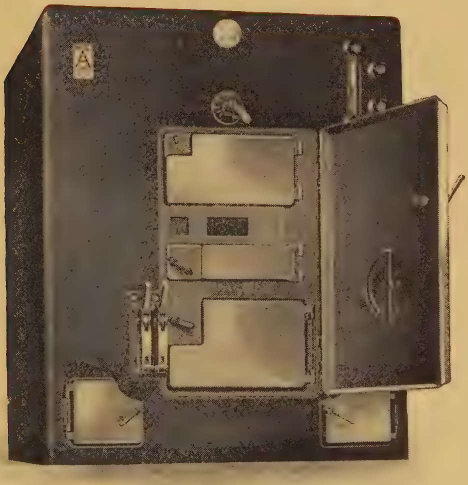
It runs from eight hours to thirty-five hours without firing, depending upon the weather. Its heat production is maintained automatically at any desired point. To regulate it requires only a simple turn of a conveniently placed handle. And it is so clean and handsome that it allows the owner to use his basement as a more livable place.

This is all made possible by the special and exclusive features in the design and construction of this Heat Machine.

First, it maintains perfectly controlled combustion of its fuel supply. The *special water-surrounded ash pit construction*, seals the combustion chamber as effectively as the glass container is sealed within a thermos bottle.

Only that much primary air supply is admitted to the combustion chamber as comes through the draft inlet, and this supply is under perfect regulation. A perfectly regulated fire is the first essential for the attainment of maximum operating efficiency.

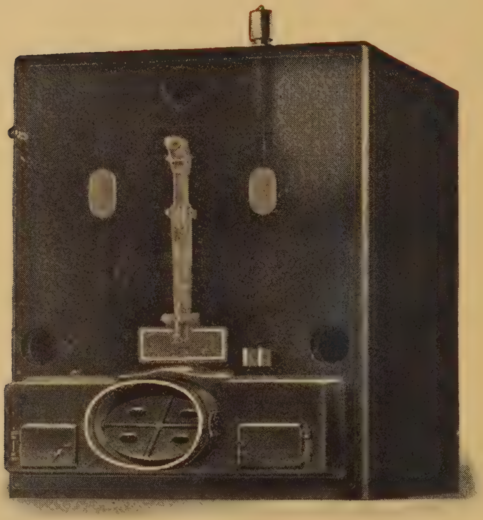
Second, set in front of the Machine directly over the large door, is a graduated dial with



View Showing Lock-Safe Fire Door Open

control handle. This is connected with the automatic draft control mechanism at the rear. A turn of the handle for more heat opens the draft panel; more air is admitted to the combustion chamber and the fire speeds up to the rate desired. It is now automatically maintained at the desired rate.

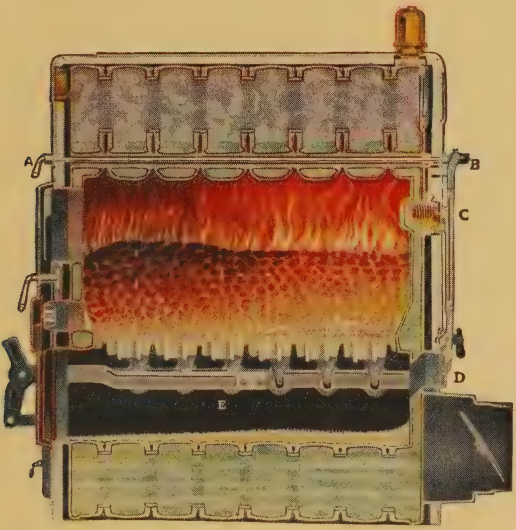
The automatic regulating device is the most sensitive and accurate in operation that has



Rear View of Type "A" Heat Machine

ever been developed. The draft panel hangs like a pendulum, and like a pendulum swings, weight-free and frictionless.

Third, the Lock-Safe Door—the large outside door—prevents any loss of heat due to carelessness, inexperience or guess-work on the part of the operator. It is an entirely new accomplishment in heating apparatus.

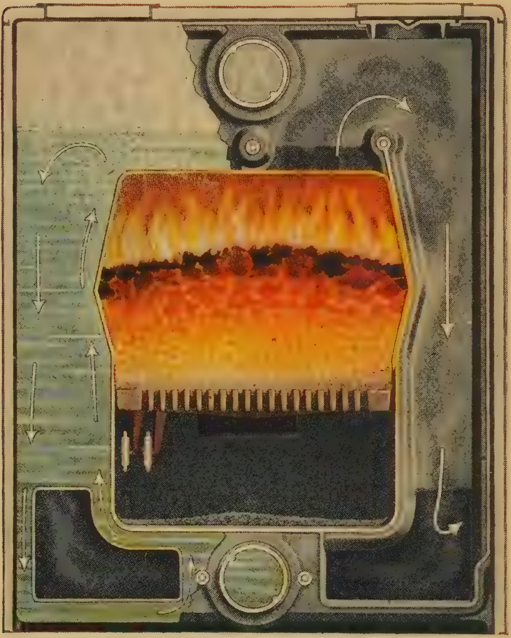


Side Sectional View of the Type "A" Heat Machine Showing Mechanism Which Secures Perfectly Controlled Combustion

A—Dial Indicator and Heat Control Lever
B—Connecting Rod
C—Metal Bellows Regulator
D—Draft Panel
E—Water-Surrounded Ash-Pit

When this door is closed, none of the smaller doors inside may be opened. It is impossible to force the fire by the wasteful practise of opening the ash pit door; and the fire cannot be killed at night by the ordinary wasteful method of opening the furnace door. Regulation, therefore, is simple, dependable and fool-proof.

Fourth, the Revertible Flue—one of the most

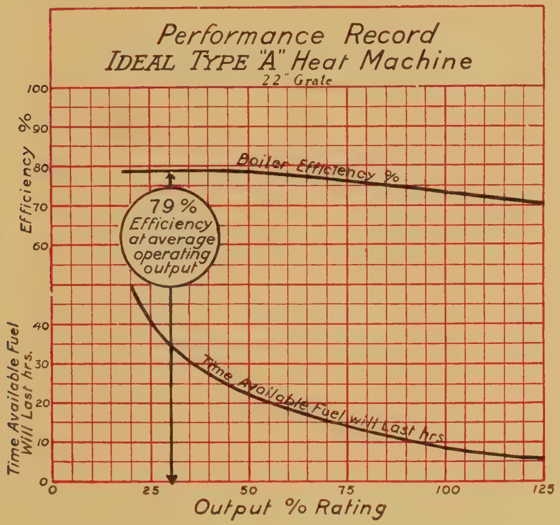


Tapered, Revertible Flue—an Exclusive, Patented Feature in the Ideal Type "A" Heat Machine.

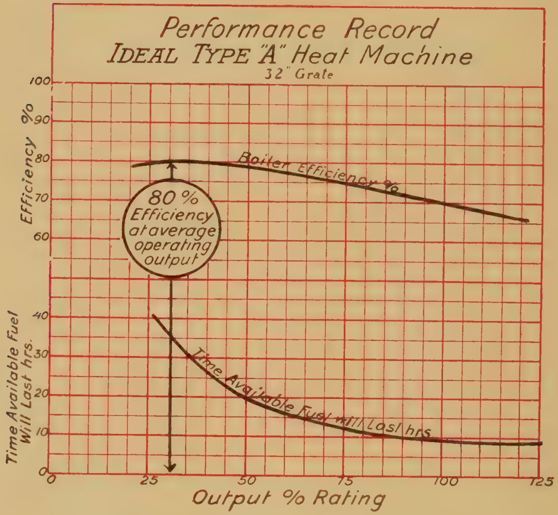
Arrows indicate the downward flow of the gases through the flue.

The left side of the section has been cut away to show the circulation of the water within the section.

distinctive features in the Type "A" Heat Machine—effects a transmission of every possible heat unit from the gases of combustion to the water in the boiler.

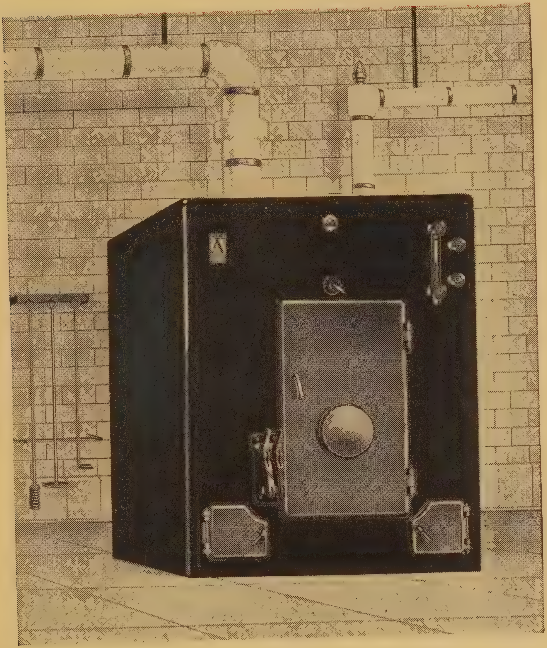


The illustration on page 58 shows clearly the travel of the gases and the coordination of their travel with the movement of the water. Not only does the Revertible Flue offer an enormous amount of heating surface above that found in the usual boiler, but it is so designed as to force a close rubbing-contact with the gases and to bring these in contact with the coolest portions



of water-backed heating surface before they leave the boiler. The result is that the gases are robbed of almost all their heat before they are allowed to enter the chimney.

Fifth, and finally, attention should be directed to the IDEAL Metal Jacket. This is lined with sixteen plies of air-celled asbestos, reinforced on both sides with ⅛ of an inch 98% pure asbestos board. The lining is scientifically gauged to

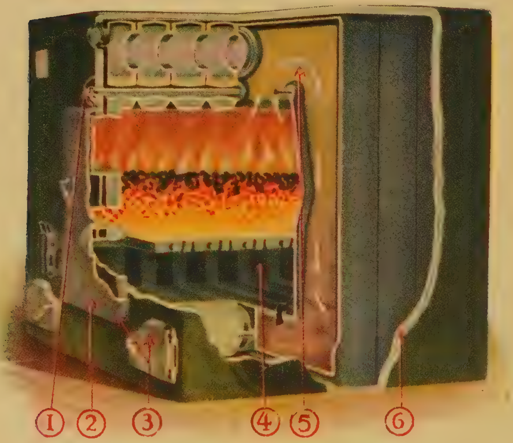


prevent radiation heat loss. The exterior of the Jacket is baked enamel—permanently handsome.

The IDEAL Metal Jacket will serve efficiently during the life of the boiler.

The IDEAL Type "A" Heat Machine has not been built to a price. It is the best that modern science and American ingenuity can produce.

EXCLUSIVE FEATURES



1. Dial Control. The control lever need only be set for more or less heat as desired. The machine does the rest. Dial is graduated and conveniently placed in front of machine.
2. Lock-Safe Fire Door. Removes guess work, carelessness or inexperience as controlling influences in operation—a final guarantee against fuel waste.
3. All Plate work has Vitreous Enamel finish—a beautiful and permanent lustre, not affected by heat.
4. Water-Surrounded Ash Pit—a new feature. It seals the combustion chamber against air leakage as effectively as a thermos bottle seals its glass container.
   Operating in conjunction with the automatic heat control, this feature establishes *perfectly controlled combustion.*
5. Arrows show the downward travel of gases through the Revertible Flue. Note the progressive contraction of the flue, securing a continuous rubbing contact with the hot gases and insuring maximum utilization of their heat.
6. Ideal Metal Jacket—made of sheet steel, Japanned finish, lined with 16 ply air-cell asbestos. It saves large amounts of coal yearly through its prevention of radiation loss. It is dust proof, moisture-proof and durable.

Ratings and Data

STEAM

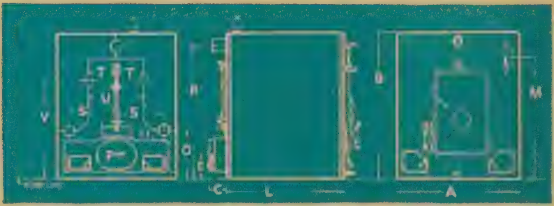
Number of Boiler	Rating Sq. Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
S-2204-A	1000	2.76	245	26	1-6	2-5	12x12	35
S-2205-A	1250	3.68	328	32	1-6	2-5	12x16	35
S-2206-A	1500	4.60	411	38	1-6	2-5	12x16	35
S-2207-A	1750	5.52	494	44	1-6	2-5	12x16	40
S-2208-A	2000	6.44	577	50	1-6	2-5	12x16	45
S-2209-A	2250	7.36	660	56	1-6	2-5	12x16	45
S-3205-A	2500	6.22	660	36	1-8	2-6	16x16	40
S-3206-A	3000	7.77	825	43	1-8	2-6	16x16	40
S-3207-A	3500	9.32	990	50	1-8	2-6	16x20	40
S-3208-A	4000	10.87	1155	57	1-8	2-6	16x20	45
S-3209-A	4500	12.42	1320	64	1-8	2-6	20x20	45
S-3210-A	5000	13.97	1485	71	1-8	2-6	20x20	50
S-3211-A	5500	15.52	1650	78	1-8	2-6	20x20	50
S-3212-A	6000	17.07	1815	85	1-8	2-6	20x20	55

Safety Valve sizes accord with A. S. M. E. boiler code.

WATER

Number of Boiler	Water Rating Sq.Ft.	Grate Area Sq. Ft.	Fuel Capacity Lbs.	Total Length "L" Ins.	Outlets No. and Size	Inlets No. and Size	Chimney Size Ins.	Chimney Height Ft.
W-2204-A	1600	2.76	245	26	1-6	2-5	12x12	35
W-2205-A	2000	3.68	328	32	1-6	2-5	12x16	35
W-2206-A	2400	4.60	411	38	1-6	2-5	12x16	35
W-2207-A	2800	5.52	494	44	1-6	2-5	12x16	40
W-2208-A	3200	6.44	577	50	1-6	2-5	12x16	45
W-2209-A	3600	7.36	660	56	1-6	2-5	12x16	45
W-3205-A	4000	6.22	660	36	1-8	2-6	16x16	40
W-3206-A	4800	7.77	825	43	1-8	2-6	16x16	40
W-3207-A	5600	9.32	990	50	1-8	2-6	16x20	40
W-3208-A	6400	10.87	1155	57	1-8	2-6	16x20	45
W-3209-A	7200	12.42	1320	64	1-8	2-6	20x20	45
W-3210-A	8000	13.97	1485	71	1-8	2-6	20x20	50
W-3211-A	8800	15.52	1650	78	1-8	2-6	20x20	50
W-3212-A	9600	17.07	1815	85	1-8	2-6	20x20	55

For prices see Current Trade Discount Sheet



Measurements are in Inches

BOILER	A	B	C	E	M	O	P	R	S	T	U	V
S or W-2204-A to 2209-A	41½	61¼	8¼	8⅜	50	19¾	12	56	15 9/16	9⅛	18¼	41
S or W-3205-A to 3212-A	57½	69	10¼	11 5/16	56¾	23	18	63⅛	22⅞	13⅜	26¾	47

S or W-2204-A to 2209-A Boiler has 12" Round Smoke Pipe Collar
S or W-3205-A to 3212-A Boiler has oval Smoke Pipe Collar for 18" pipe

Chimney Dimensions

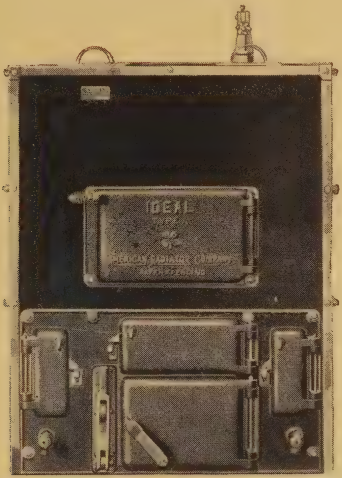
Boiler Steam or Water	Two Boilers			Three Boilers			Four Boilers			Five Boilers		
	Rating Steam	Size Ins.	Height Ft.	Rating Steam	Size Ins.	Height Ft.	Rating Steam	Size Ins.	Height Ft.	Rating Steam	Size Ins.	Height Ft.
2204-A	2000	12 x 16	40	3000	16 x 16	45						
2205-A	2500	16 x 16	40	3750	16 x 20	45						
2206-A	3000	16 x 16	40	4500	16 x 20	45						
2207-A	3500	16 x 16	45	5250	16 x 20	45						
2208-A	4000	16 x 16	45	6000	16 x 20	50						
2209-A	4500	16 x 16	50	6750	16 x 20	50						
3205-A	5000	20 x 20	45	7500	20 x 24	50	10000	24 x 24	55	12500	24 x 28	60
3206-A	6000	20 x 20	45	9000	20 x 24	50	12000	24 x 24	55	15000	24 x 28	60
3207-A	7000	20 x 24	45	10500	24 x 24	50	14000	24 x 28	55	17500	28 x 32	65
3208-A	8000	20 x 24	50	12000	24 x 24	55	16000	24 x 28	60	20000	28 x 32	65
3209-A	9000	24 x 24	55	13500	24 x 28	60	18000	28 x 28	65	22500	30 x 32	70
3210-A	10000	24 x 24	55	15000	24 x 28	60	20000	28 x 28	65	25000	30 x 32	70
3211-A	11000	24 x 24	60	16500	24 x 28	65	22000	28 x 28	70	27500	30 x 32	75
3212-A	12000	24 x 24	65	18000	24 x 28	70	24000	28 x 28	75	30000	30 x 32	80

Boiler Equipment

STEAM BOILER—IDEAL asbestos-lined Metal Jacket, Arco Automatic Steam Regulator, Pop Safety Valve, Steam Gauges, Water Column and Trimmings, Tri-cocks, Draw-off Cock and Firing Tools.

WATER BOILER—IDEAL asbestos-lined Metal Jacket, Arco Automatic Temperature Regulator, Thermometer, Altitude Gauge, Draw-off Cock and Firing Tools.

1-A Series



(Pat'd July 29, 1919; Nov. 15, 1921; Other Patents Pending)

Front View

Steam Capacity 450 to 900 sq. ft.
Water Capacity 750 to 1500 sq. ft.

IDEAL Type "A" Heat Machines of the 1-A Series are very similar in principle and fire travel to those of larger capacities, as described on pages 53-62. The Machines of the 1-A Series are the most efficient and economical of all heating boilers of similar capacities. Having extremely low water lines, they are particularly adapted for buildings with low cellars.

Ideal Type "A" Heat Machines of the 1-A Series are covered with the famous asbestos lined Ideal Metal Jacket, held in place by heavily nickel plated cover pieces and keys.

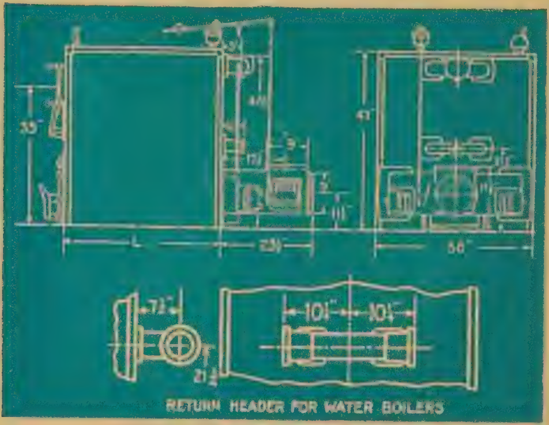
Ratings and Dimensions

1-A Series

Steam

Number of Boiler	Rating Sq. Ft.	Grate Area Sq. Ft.	Total Length "L" Inches	Hard Coal Fuel Capacity Lbs.	Outlet No. and Size	Inlet No. and Size	Chimney Size (Sea Level) Ins.	Chimney Height Ft.
1-A-4	450	1.9	22	126	1-4	1-2	8x12	30
1-A-5	600	2.5	27½	168	1-4	1-2	8x12	35
1-A-6	750	3.1	33	210	1-4	1-2	8x12	35
1-A-7	900	3.7	38½	252	1-4	1-2	8x12	40
Water								
1-A-40	750	1.9	22	126	1-4	2-4	8x12	30
1-A-50	1000	2.5	27½	168	1-4	2-4	8x12	35
1-A-60	1250	3.1	33	210	1-4	2-4	8x12	35
1-A-70	1500	3.7	38½	252	1-4	2-4	8x12	40

For price, see Current Trade Discount Sheet.
Safety Valve sizes accord with A. S. M. E. boiler code.



Fire Door Dimensions—14½ x 9 Inches

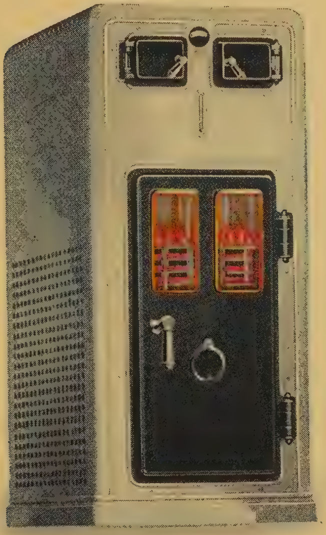
Equipment

IDEAL Asbestos lined Metal Jacket.
Two solid brass Draw-off Cocks and Firing Tools supplied with all Boilers.

Steam Boiler

Automatic Damper Regulator.
Extra heavy Water Column and Tri-Cocks. 4½" IDEAL Steam Gauge.

IDEAL ARCOLA PARLOR HEATER



Patents Pending

Burns all Kinds of Fuel.

TO ALL who are eager to enjoy the great economy and convenience of having an ideal hot water heating outfit entirely within the rooms of the home, whether that home be of the cellar or cellarless type, the IDEAL Arcola Parlor Heater will have an instant appeal.

For the IDEAL Arcola Parlor Heater is truly a thing of beauty, in perfect harmony with any scheme of interior decoration; and its special design and construction insures cleanliness and ease of operation.

The new model herein offered unites the very latest improvements in modern heating equipment. The smooth exterior finish glows with the bright luster found on the most expensive new automobile; but the Arcola finish is permanent, for it is vitreous enamel, applied under careful supervision in our own specially erected enameling plant.

In fine contrast to the glistening gray cover are the black doors of the same enduring luster.

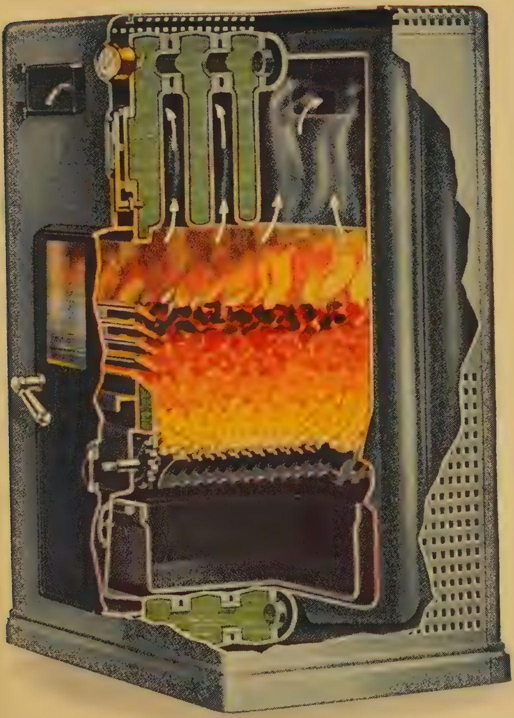
The glow panels in the large front door are made of a special glass mixture, prepared particularly to withstand fire temperatures without flaking, breaking or losing transparency. A damp cloth with ordinary cleansing powder is all that is required to keep them clean.

The IDEAL Arcola Parlor Heater is equipped with a new automatic heat control device, accurate, dependable and easily regulated.

The regulating handle on the graduated dial at the rear need only be turned for more or less heat as required.

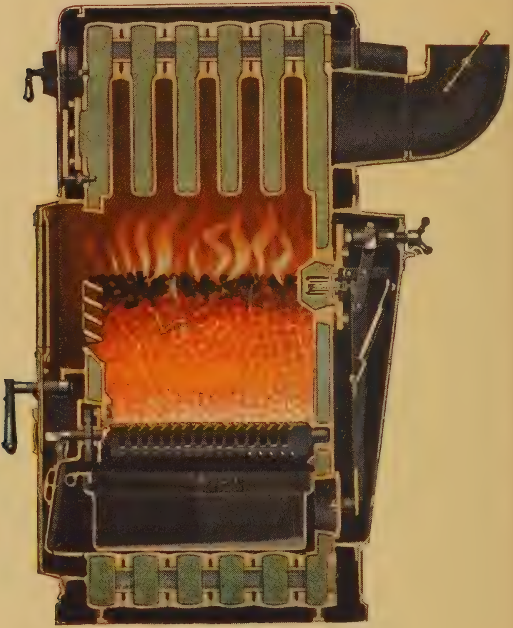
Setting the handle adjusts the automatic mechanism. The frictionless-operating draft panel

Cross Section



Cutaway view showing water-surrounded ash pit, large combustion chamber and fire travel.

at the base, maintains a precise and automatic control over the supply of air admitted to support combustion. No air may enter the fire chamber at any other place, for the gas-tight construction formed by the water-



Showing Automatic Damper Regulator
Patent Pending

surrounded ash pit and the Lock-Safe Fire Door seals the combustion chamber as tightly as the glass container is sealed within a thermos bottle.

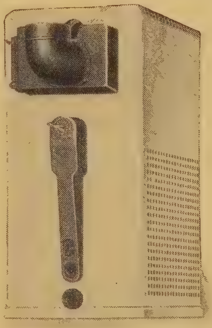
Thus a simple turn of the Heat Regulator is all that is required to maintain any desired temperature in the home. Ease and economy of operation are combined.

One of the greatest advantages of the IDEAL Arcola Parlor Heater is the remarkable saving in fuel which it accomplishes. As compared with a

cellar installation, it saves to the owner one-third his annual coal bill; while as compared with old-fashioned heating methods, its saving is considerably greater. The superiority of the IDEAL Arcola Parlor Heater in this respect is due to its unique scientific design.

By its economy of operation, the IDEAL Arcola Parlor Heater will soon have saved its own cost, thereafter representing a high interest-bearing investment to the owner—and an investment that will pay dividends also in the form of better health and genuine comfort.

The large front door—the Lock-Safe Fire Door—deserves especial commendation to the house-owner. For it takes guess work out of caretaking and saves time and trouble to the house-wife. It allows no dust or gas or soot to escape into the room, for its contact face is ground as smooth as a marble surface. This door, covering both the ash pit and fire pot, makes it impossible to force or check the fire in any wasteful manner, and is a guarantee of perfect operation.



Rear View Showing Automatic Regulator

The IDEAL Arcola Parlor Heater comes completely equipped with Automatic Heat Regulator and all other accessories. Its first cost to the consumer is the last. And its first cost is very attractive.

IDEAL ARCOLA Parlor Heating Outfits

Outfit Number	Number of Heater	Sq. Ft. Radiation
A-150-40	40	150
A-175-40	40	175
A-200-40	40	200
A-225-40	40	225
A-250-40	40	250
A-275-40	40	275
A-300-50	50	300
A-325-50	50	325
A-350-50	50	350
A-375-50	50	375
A-400-60	60	400
A-425-60	60	425
A-450-60	60	450
A-475-60	60	475
A-500-70	70	500
A-525-70	70	525
A-550-70	70	550

Outfit consists of IDEAL ARCOLA Parlor Heater Completely Equipped, Regular 38-inch high American Peerless 3-Column Radiators in quantities as listed above, assembled into as many individual radiator units as desired. Expansion Tank, Drain Valve and Vent Fitting.

Dimensions and Ratings

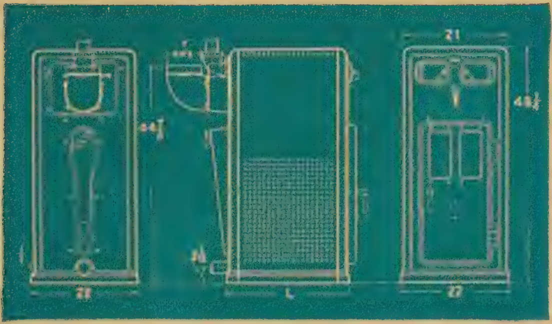
Number of Boiler	Number of Sections	Water Rating Sq. Ft.	Grate Area Sq. Ft.	Hard Coal Fuel Cap. Lbs.	Length "L" Inches	Chimney Size (Sea Level) Inches	Chimney Height Ft.	Radiating Surface of Arcola and Exp. Tank Sq. Ft.
40	4	375	.81	66	17	8x8	25	45
50	5	500	1.08	88	20½	8x8	25	50
60	6	625	1.35	110	24	8x8	30	55
70	7	750	1.62	132	27½	8x8	30	60

Tappings,—One 2½ Inch Outlet and One 2½ Inch Inlet.

For prices see Current Trade Discount Sheet

T. M's IDEAL and ARCOLA Reg. U. S. Pat Off.

Dimensions

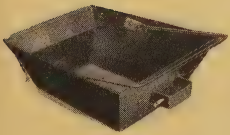


Dimensions and Ratings

No. of Boiler	No. of Sections	Water Rating Sq. Ft.	Grate Area Sq.Ft.	Hard Coal Fuel Cap.Lbs.	Length "L" Inches	Size of Outlets and Inlets	Chimney Size Inches	Chimney Height Feet
40	4	375	.81	66	17	2½	8 x 8	25
50	5	500	1.08	88	20½	2½	8 x 8	25
60	6	625	1.35	110	24	2½	8 x 8	30
70	7	750	1.62	132	27½	2½	8 x 8	30

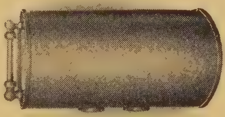
T. M's IDEAL and ARCOLA Reg. U. S. Pat. Off.

Equipment



Ashpan fits snugly, easily carried out

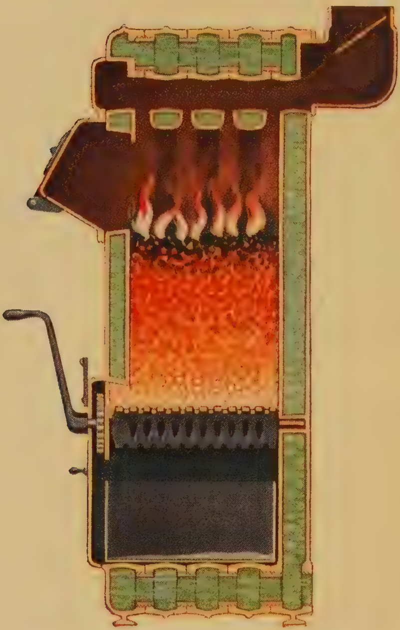
Firing Tools



Expansion Tank, furnished only with ARCOLA Outfits

IDEAL ARCOLA Parlor Heater comes completely equipped with Cover, Automatic Draft Regulator, Altitude Gauge, Thermometer, Ashpan and Firing Tools.

IDEAL ARCOLA HEATER

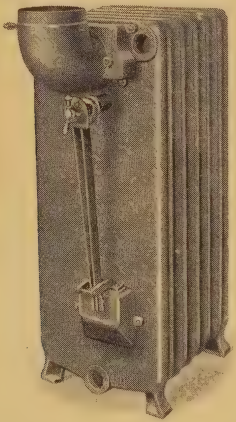


Cross Section showing water surrounded ash-pit, fire travel and up-looking smokehood.

MORE than a half million people now enjoy the economy and comfort of IDEAL ARCOLA Heaters. Used for heating homes with or without basements, stores, apartments, garages and other small buildings, they have made hot water radiator heat available where before only old-fashioned and less efficient methods could be used.

The IDEAL ARCOLA Heater is similar in principle to the IDEAL ARCOLA Parlor Heater but is not equipped with the enameled cover, automatic damper regulator, altitude gauge or thermometer.

Arcola Automatic Heat Regulator



An Added Convenience

ALTHOUGH the IDEAL ARCOLA Heater is not regularly supplied with automatic regulation, it is designed so that an automatic heat regulating device may easily be added at any time.

The Automatic Heat Regulator is placed at the rear of the ARCOLA. To obtain more or less heat, it is only necessary to turn the handle on its dial. The automatic mechanism then accurately maintains the desired heat output without further attention.

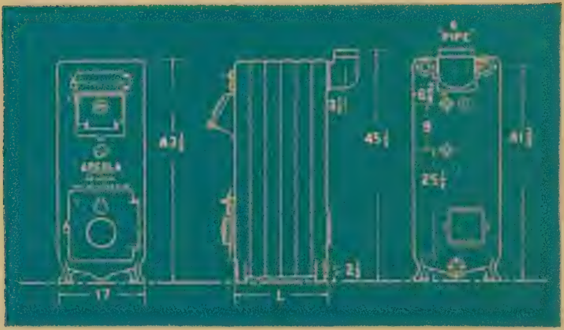
The great convenience of the Automatic Heat Regulator will appeal strongly to owners of the IDEAL ARCOLA Heater. Attractively priced, easily and quickly set in place, it presents an excellent opportunity for a large additional business. It will function efficiently during the life of the IDEAL ARCOLA Heater—which is that of the home itself.

Dimensions and Ratings

Number of Boiler	Number of Sections	Rating Square Feet	Fuel Capacity Pounds	Length "L" Inches	Radiating Surface of Arcola and exp. tank sq. ft.
No. 4H	4	200	60	12	45
No. 5H	5	300	80	15	50
No. 6H	6	400	100	18	55
No. 7H	7	500	120	21	60
No. 8H	8	600	140	24	65

See Current Trade Discount Sheets for prices and shipping weights.
IDEAL ARCOLA Heaters are shipped complete in crate.
Oval smoke pipe connection will take 6 in. diameter smoke pipe.
Flow pipe tapping, 2-2 in. Return pipe tapping, 2 in.

T. M's IDEAL and ARCOLA, Reg. U. S. Pat Off.
Pat'd. January 18, 1921. December 4, 1923.



IDEAL Steam and Water Heating Boilers for Oil Burning

The several points of merit attached to oil as a fuel have earned for it, during the past few years, a very wide and growing use in domestic heating service.

Whereas all IDEAL Boilers may be used for oil burning, the IDEAL Water Tube Boiler and the IDEAL Type "A" Heat Machine are particularly adapted for its satisfactory and economical burning. Years of service and extensive laboratory tests bear witness to the fact. In both instances the large, low openings in the front sections make extremely simple and convenient the installation of the oil burner.

The IDEAL Water Tube Boiler with its water-backed side walls affords a large combustion chamber, and permits the installation of the burner at a very low level. In this boiler the maximum amount of heat is extracted from the radiant energy of the oil flame while the gases of combustion pass to the rear of the boiler, then upward, then horizontally around the vertical water tubes to the front of the boiler, then upward and around the vertical water tubes again to the rear—a distance twice the length of the boiler. It will thus be seen that the long horizontal travel of the gases allows the maximum amount of their heat to be extracted before they pass to the chimney.

The IDEAL Type "A" Heat Machine is especially adapted to oil burners that spread the flame all over the fire chamber. Its single ring type sectional design forms a large combustion chamber, completely water-surrounded, wherein the oil is completely burned. The walls of the combustion chamber absorb all of the radiant heat of the flames before the gases pass into the long revertible side flues of the boiler, where the remaining amount of their heat is extracted in the utmost possible degree.

For most economical results, boilers for oil burning should be chosen in accordance with the general practice for selecting and installing boilers for solid fuel burning.

IDEAL Boilers for oil firing are regularly shipped without grates, grate equipment or firing tools. However, if at any time after installation it is desired to change over to coal, coal burning equipment can be ordered and the necessary changes made in a few hours.

There are many different types of oil burners on the market, some of which are better suited to one or the other of the above mentioned boilers. In choosing a boiler for oil, great care should be taken in selecting the type of boiler best suited to the burner to be used.

Showing Space Available for
Installation of Oil Burners

Type "A" Heat Machine

		22″ Grate	32″ Grate
Ashpit Door	Width	14¾	21¼
	Height	11¼	13¼
Clinker Door	Width	14⅝	19¾
	Height	4½	4¾
Fire Door	Width	14⅝	19¾
	Height	9⅞	9½

Firebox Dimensions Level with Sill of Fire door—
7 section Boiler

Length	35¼	41¼
Increase of length per section	6	7
Width	26	36
Height from Grates	23	24
Height from bottom of Ashpit	36	39

Water Tube Boilers

		23″Grate	29″Grate	36″Grate	48″Grate
Ashpit Door	Width	14¼	18	21⅞	23⅞
	Height	9½	9¾	9¾	10⅜
Clinker Door	Width	14½	18	....	29¾
	Height	5	5	....	4½
Fire Door	Width	14⅞	18	19½	18¾
	Height	8⅜	8¾	11¾	9 to 11⅛

Firebox Dimensions Level with Sill of Fire door—
7 section Boiler

Length	24½	35½	35¼	64
Increase of length per section	4	6	6	10¾
Width	21¼	27	36	46
Height from Grates	16⅞	19	23½	23¼
Height from bottom of Ashpit	30⅛	33	38⅜	37¾

Note: All dimensions are in inches.

ARRANGEMENT OF GRATE BARS

IDEAL 23″ Water Tube Boiler

Boiler No. Steam or Water	L. H. Front Grate Bars	R. H. Rear Grate Bars
2305	3	. .
2306	4	. .
2307	3	2
2308	3	3
2309	4	3

IDEAL 29″ Water Tube Boiler

Boiler No. Steam or Water	L. H. Front Grate Bars	R. H. Rear Grate Bars
2905	3	. .
2906	2	2
2907	3	2
2908	3	3
2909	4	3
2910	4	4
2911	5	4

IDEAL 36″ Water Tube Boiler

Boiler No. Steam or Water	L. H. Front Grate Bars	R. H. Rear Grate Bars
3605	2	2
3606	3	2
3607	3	3
3608	4	3
3609	4	4
3610	5	4
3611	5	5
3612	6	5
3613	6	6
3614	7	6
3615	7	7

IDEAL 48″ Water Tube Boiler

Boiler No. Steam or Water	L. H. Front Grate Bars	R. H. Rear Grate Bars	Size R. H. Front Half Connecting Arm	Dead Plates	
				Front	Rear
4806	3	2	Short	. . . .	. . . .
4807	3	3	Short	. . . .	. . . .
4808	4	3	Medium	. . . .	. . . .
4809	4	3	Medium	1	. . . .
4810	4	4	Medium	1	. . . .
4811	4	4	Medium	1	1
4812	4	4	Medium	1	2
4813	5	4	Long	1	2
4814	5	4	Long	1	3

IDEAL Sectional Boilers

Boiler No. Steam or Water	L. H. Grate Bars	R. H. Grate Bars	Size Front Half Connecting Arm
19-5	4	. . . .	. . . .
19-6	5	. . . .	. . . .
19-7	6	. . . .	. . . .
22-5	2	2	. . . .
22-6	3	2	. . . .
22-7	3	3	Medium
25-5	2	2	. . . .
25-6	3	2	Medium
25-7	3	3	Medium
25-8	4	3	Long
28-5	2	2	. . . .
28-6	3	2	Medium
28-7	3	3	Medium
28-8	4	3	Long

ARRANGEMENT OF GRATE BARS

IDEAL Type "A" Heat Machine

2204-A	*2	..	3205-A	*3	..
2205-A	*3	..	3206-A	*2	*2
2206-A	*2	*2	3207-A	*3	*2
2207-A	*3	*2	3208-A	*3	*3
2208-A	*3	*3	3209-A	*4	*3
2209-A	*4	*3	3210-A	*4	*4
			3211-A	*5	*4
			3212-A	*5	*5

*All grate bars shake on left hand side of ashpit.

IDEAL 29″ Smokeless Boiler

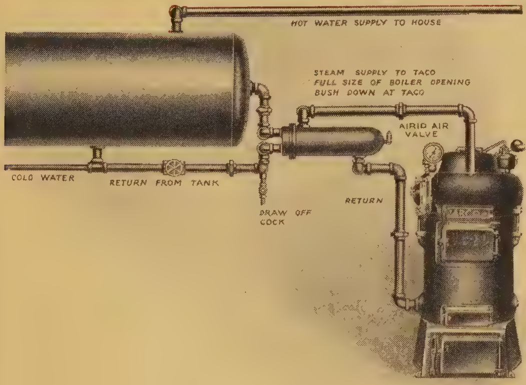
Boiler No. Steam or Water	L. H. Front Grate Bars	R. H. Rear Grate Bars
2906-S	2	2
2907-S	3	2
2908-S	3	3
2909-S	4	3
2910-S	4	4
2911-S	5	4

IDEAL 36″ Smokeless Boiler

Boiler No. Steam or Water	L. H. Front Grate Bars	R. H. Rear Grate Bars
3607-S	3	3
3608-S	4	3
3609-S	4	4
3610-S	5	4
3611-S	5	5
3612-S	6	5
3613-S	6	6
3614-S	7	6
3615-S	7	7

IDEAL 48″ Smokeless Boiler

Boiler No. Steam or Water	L. H. Front Grate Bars	R. H. Rear Grate Bars	Size R. H. Front Half Connecting Arm	Dead Plates	
				Front	Rear
4807-S	3	3	Short	....	....
4808-S	4	3	Medium	....	....
4809-S	4	3	Medium	1	....
4810-S	4	4	Medium	1	....
4811-S	4	4	Medium	1	1
4812-S	4	4	Medium	1	2
4813-S	5	4	Long	1	2
4814-S	5	4	Long	1	3



Typical Outfit with Steam Boiler

The Steam Taco Domestic Hot Water Heating Outfit, being very simple and compact, including Taco Heater and storage tank in connection with an IDEAL steam heating boiler, offers several decided advantages.

It relieves the boiler of any possible excessive water pressure by transferring it to the Taco Heater. It keeps the boiler clean by precipitating in the Taco, lime or other foreign matter; and the Taco is accessible for easy cleaning or replacement. It insures a supply of hot water free of discoloration, because the interior of the Taco consists of copper and bronze. Also, the automatic regulation on the boiler maintains fuel economy and prevents overheating of water.

The system can be installed in shallow basements by placing the Taco so that its bottom is one inch above the water line of the boiler, the bottom of the tank being level with the top of Taco.

TACO HOT WATER HEATING OUTFIT

Range Boilers Size Inches	TANK Capacity Gallons Heated 100F. in 3 hours	Gallons Heated 100 F. in 1 hour	Taco	Size of Steam Boiler and Hot Water Supply Boiler Recommended		
				Type "A" Steam	Hot Water Supply Boiler	Arco Round Boiler Steam
		Water	Taco	Heater		
12-60	30	10	No. 2	....	01	.....
14-60	40	13	No. 2	....	02	.....
16-60	52	17	No. 3	....	02	.....
18-60	66	22	No. 3	....	03	.....
20-60	82	27	No. 4	....	04	.....
22-60	100	33	No. 4	....	05	.....
24-60	120	40	No. 4	....	06	.....
24-72	144	48	No. 4	....	06	.....
24-96	192	64	No. 5	....	07	.....
Storage Tanks Inches		Steam	Taco	Heater		
24-72	141	47	No. 2	....	.....	.....
.....	150	50	No. 2	....	.....	.....
24-84	164	55	No. 3	....	.....	.....
24-96	188	63	No. 3	....	.....	.....
30-72	221	74	No. 3	....	.....	.....
30-84	258	86	No. 3	....	.....	1704
30-96	294	98	No. 3	....	.....	1705
.....	300	100	No. 3	....	.....	1705
30-108	335	112	No. 4	....	.....	1706
30-120	372	124	No. 4	....	.....	1904
30-144	440	147	No. 4	....	.....	1906
36-108	477	159	No. 4	....	.....	2005
36-120	530	177	No. 4	....	.....	2006
.....	600	200	No. 4	....	.....	2006
36-144	636	212	No. 5	....	.....	2206
42-108	644	215	No. 5	....	.....	2206
42-120	716	237	No. 5	S-2204-A	.....	2504
42-144	860	290	No. 5	S-2205-A	.....	2804
42-168	1004	335	No. 5	S-2206-A	.....	2805
42-192	1148	363	No. 5	S-2206-A	.....	3104
.....	1200	400	No. 5	S-2207-A	.....	3105
48-168	1319	440	No. 6	S-2207-A	.....	3106
48-192	1500	500	No. 6	S-2208-A	.....	.....
54-168	1665	555	No. 6	S-2209-A	.....	.....
.....	1800	600	No. 6	S-3205-A	.....	.....
54-192	1905	635	2-No. 5	S-3205-A	.....	.....
60-168	2052	684	2-No. 5	S-3206-A	.....	.....
60-192	2347	782	2-No. 5	S-3207-A	.....	.....
.....	2400	800	2-No. 5	S-3207-A	.....	.....
.....	3600	1200	2-No. 6	S-3210-A	.....	.....

NOTE.—Bottom of Taco may be placed one inch above Normal Water Line of Steam Boiler.
Bottom of Tank may be placed on a Level with Top of Taco.
There is practically no loss of pressure through Taco because of large area.

IDEAL HOT WATER SUPPLY BOILERS

THE IDEAL Hot Water Supply Boiler insures a steady supply of hot water for every household use. It may be connected by piping to all parts of the house. With its help, housekeeping becomes a lighter and a pleasanter task.

Not only does the boiler extend the genuine comfort and convenience of having a reliable hot water supply right where it is wanted, but it is extremely economical in its service. On the same amount of fuel that would be required by other methods to produce a kettle of hot water, the IDEAL Hot Water Supply Boiler will furnish a far greater supply.

The boiler is also desirable for numerous other purposes requiring hot water; e.g. washing, heating, tempering, anti-freezing purposes, etc. etc.

IDEAL Hot Water Supply Boilers are made of the highest grade cast iron. This iron is the most efficient material that can be used. It is unique in its virtual immunity from the deteriorating effects of rust.

The boilers are designed to burn all kinds of fuel, particularly hard or soft coal, coke, gas, or wood. Parts are joined by finely lathe-turned screw nipples, made of the same iron mixture that is used in the boiler itself, thus insuring uniform expansion and contraction throughout, and permanently water-tight joints.

IDEAL HOT WATER SUPPLY BOILERS

Ideal Nos. 01-03

No.	*Nominal Capacities	Style of Grate	Nominal Diam. Grate Inches	Grate Area Sq. Ft.	Outlets and Inlets No. and Size, Ins.
01	56	Slide	10	.59	1-1½
02	93	"	10	.54	1-1½
03	144	"	10	.59	1-1½

Ideal Nos. 04-09

No.	*Nominal Capacities	Style of Grate	Nominal Diam. Grate Inches	Grate Area Sq. Ft.	Outlets and Inlets No. and Size, Ins.
4	192	Rocking	12	.80	3-1½
†05	210	"	12	.80	3-1½
06	384	"	15	1.23	3-2
†07	426	"	15	1.23	3-2
08	600	"	18	1.92	3-2
†09	660	"	18	1.92	3-2

†Equipped with Dome sections, all others have fire pot section only, or, no intermediate sections used.

Ideal Arco Nos. 10-15

No.	*Nominal Capacites	Style of Grate	Nominal Diam. Grate Inches	Grate Area Sq. Ft.	Outlets and Inlets No. and Size, Ins.
Arco 10	81	Rocking	10	.50	1-1½
" 12	148	"	12	.80	1-1½
" 15	242	"	15	1.23	1-1½

*Gallons per hour per 25 degree rise on 8-hour firing period, with hard coal.

All the above boilers have butterfly type damper and ashpit door for automatic regulation.

When Hot Water Supply Boilers are subjected to some unusual pressure, as is the case when tanks are connected direct to city pumping station, and the pressure is increased during times of conflagration or the like, it is recommended that the system be equipped with a Water-Pressure Reducing Valve and Relief Valve.

No firing tools are supplied with above Boilers.

In cases of unusually high city water pressure or where the demand for hot water supply is very large, we recommend the use of Ideal Steam Boilers in connection with storage tank.

HOT WATER SUPPLY BOILERS

No. 1 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr-B. T. U.	18144	15120	12960	11340	10080	9072	8247	7560

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	90	74	64	56	50	45	41	37
Degr. Fahr 50	45	37	32	28	25	23	20	19
Per Hour 100	21	17	15	13	11	10	8	7

No. 10 Ideal—Arco

Hours	5	6	7	8	9	10	11	12
Power per Hr-B. T. U.	27200	22666	19428	17000	15111	13600	12363	11333

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	130	108	93	81	72	65	59	54
Degr. Fahr 50	165	53	46	40	36	32	29	27
Per Hour 100	32	27	23	20	18	16	14	13

No. 02 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr-B. T. U.	30808	25666	22000	19250	17111	15400	14000	12833

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	148	124	106	93	82	74	67	62
Degr. Fahr 50	74	62	53	46	41	37	34	31
Per Hour 100	36	30	26	23	20	18	17	15

No. 03 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr-B. T. U.	48000	40000	34285	30000	26666	24000	21818	20000

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	231	192	165	144	128	116	105	96
Degr. Fahr 50	116	96	82	72	64	58	52	48
Per Hour 100	58	48	41	36	32	29	26	24

No. 12 Ideal—Arco

Hours	5	6	7	8	9	10	11	12
Power Per Hr-B. T. U.	49280	41066	35200	30800	27377	24640	22400	20533

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	236	197	169	148	131	118	107	99
Degr. Fahr 50	118	97	84	74	66	59	54	49
Per Hour 100	60	50	43	38	33	30	27	25

No. 04 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr-B. T. U.	64000	53333	45714	40000	35555	32000	29090	26666

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	307	257	219	192	171	154	139	128
Degr. Fahr 50	154	128	110	96	85	77	70	64
Per Hour 100	77	64	55	48	43	39	35	32

*Note: To obtain output in sq. ft. water radiation per hr. divide Power per hr. B. T. U. by 150.

HOT WATER SUPPLY BOILERS

No. 05 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr.-B. T. U.	70400	58666	50285	44000	39111	35200	32000	29333

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	336	280	240	210	187	168	154	140
Degr. Fahr 50	168	140	120	105	93	84	77	70
Per Hour 100	84	70	60	53	47	42	39	35

No. 15 Ideal—Arco

Hours	5	6	7	8	9	10	11	12
Power Per Hr.-B. T. U.	80640	67200	57600	50400	44800	40320	36654	33600

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	388	323	277	242	216	194	176	162
Degr. Fahr 50	194	162	139	121	108	97	88	81
Per Hour 100	96	80	69	60	53	48	44	40

No. 06 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr.-B. T. U.	128000	106666	91428	80000	71111	64000	58181	53333

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	614	512	439	384	341	307	280	256
Degr. Fahr 50	307	256	220	192	170	154	140	128
Per Hour 100	153	128	110	96	85	77	70	64

No. 07 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr.-B. T. U.	140800	117000	100571	88000	78222	70400	64000	58666

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	672	560	480	426	373	336	305	280
Degr. Fahr 50	336	280	240	213	187	168	153	140
Per Hour 100	168	140	120	106	93	84	76	70

No. 08 Ideal

Hours	5	6	7	8	9	10	11	12
Power Per Hr.-B. T. U.	200000	166666	142857	125000	111111	100000	90909	83333

Capacity in U. S. Gallons Per Hour

Temp. Rise 25	960	800	685	600	533	480	440	400
Degr. Fahr 50	480	400	342	300	267	240	220	200
Per Hour 100	240	200	171	150	133	120	110	100

No. 09 Ideal

Hours	5	6	7	8	9	10	11	12
Per Power Hr.-B. T. U.	220000	183333	157142	137500	122222	110000	100000	91666

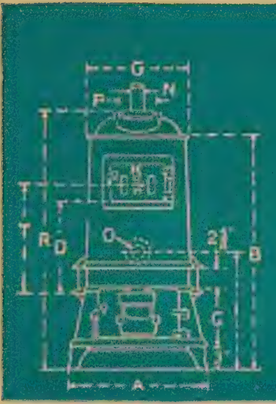
Capacity in U. S. Gallons Per Hour

Temp. Rise 25	1056	880	754	660	587	528	480	440
Degr. Fahr 50	528	440	377	330	294	264	240	220
Per Hour 100	264	220	189	165	147	132	120	110

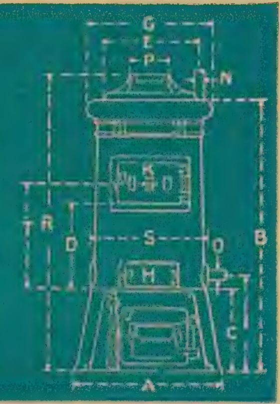
*Note: To obtain output in sq. ft. water radiation per hr. divide Power per hr. B. T. U. by 150.

Dimensions

(See Measurements, next page)



No. 02 IDEAL
Same applies to Nos. 01 and 03.



No. 09 IDEAL
Same applies to Nos. 04, 05, 06, 07 and 08.

IDEAL Arco Nos. 10, 12, 15

Dimensions (Inches)

Number of Boiler	Nominal Diameter of Grate	A Diameter of Base	B Height to Top of Supply Tap	C Height of Base	E Dist. bet. Center Supply Tapping	I Height to Center of Return Tap	R Height to Top of Smoke-Hood	S Dimen. of Firepot at Return Taps.	T Top of Grate to Center of Fire Door
01	10	$15\frac{1}{4}$	$24\frac{5}{32}$	$7\frac{21}{32}$	....	$14\frac{25}{32}$	$27\frac{5}{8}$	....	$8\frac{3}{4}$
02		18	31	$7\frac{5}{8}$	....	$14\frac{1}{2}$	$34\frac{1}{2}$	....	14
03		18	$32\frac{5}{8}$	$7\frac{5}{8}$	....	$12\frac{1}{4}$	$36\frac{1}{8}$	....	$17\frac{1}{8}$
04	12	$23\frac{1}{8}$	$36\frac{3}{8}$	$12\frac{7}{8}$	12	$14\frac{3}{4}$	$40\frac{3}{8}$	$18\frac{3}{4}$	$16\frac{1}{4}$
05		$23\frac{1}{8}$	$42\frac{1}{8}$	$12\frac{7}{8}$	$14\frac{3}{4}$	$14\frac{3}{4}$	$45\frac{7}{8}$	$18\frac{3}{4}$	$16\frac{1}{4}$
06	15	$24\frac{3}{4}$	$42\frac{3}{8}$	$12\frac{7}{8}$	$14\frac{7}{8}$	$14\frac{7}{8}$	48	$20\frac{9}{16}$	$21\frac{7}{8}$
07		$24\frac{3}{4}$	$48\frac{1}{8}$	$12\frac{7}{8}$	$17\frac{1}{4}$	$14\frac{7}{8}$	$53\frac{1}{2}$	$20\frac{9}{16}$	$21\frac{7}{8}$
08	18	$27\frac{1}{8}$	$42\frac{1}{2}$	$12\frac{7}{8}$	$18\frac{1}{4}$	15	$47\frac{3}{4}$	$23\frac{7}{8}$	$21\frac{3}{8}$
09		$27\frac{1}{8}$	$48\frac{3}{4}$	$12\frac{7}{8}$	$17\frac{3}{4}$	15	$54\frac{1}{8}$	$23\frac{7}{8}$	$21\frac{3}{8}$

Diameter of Pipe Collar "P," for Nos. 01, 02, 03 is 5 inches; for 04, 05, 06 is 6 inches, and for 08, 09 is 7 inches.

Boilers Nos. 01 to 03 inclusive will be regularly furnished with base bottom and legs, which on special order can be furnished for Nos. 04 to 09 Boilers. When this bottom and legs are used under Nos. 04 to 09, add $3\frac{3}{4}$ inches to B, I and R measurements.

IDEAL Arco Hot Water Supply Boilers

No.	A	B	D	I	P	R	S
10	16	$21\frac{1}{2}$	$26\frac{3}{4}$	$9\frac{5}{8}$	5	$27\frac{1}{2}$	$12\frac{1}{8}$
12	$19\frac{1}{2}$	$22\frac{3}{8}$	$27\frac{1}{2}$	$9\frac{7}{8}$	5	$28\frac{1}{4}$	$14\frac{1}{8}$
15	21	$24\frac{1}{2}$	$30\frac{1}{4}$	$10\frac{3}{8}$	6	31	$16\frac{7}{8}$

AMERICAN RADIATORS

SERVICE

AMERICAN Radiators are quickly obtainable in all parts of the United States. With eleven radiator foundries and twenty-four warehouses in the larger, centrally located cities, they are always available when needed.

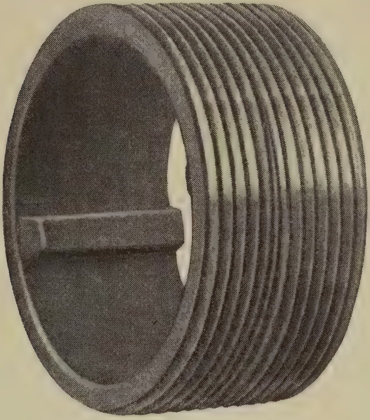
American Radiators are manufactured in the following cities:

Buffalo, N. Y.
Detroit, Mich.
Titusville, Pa.
Springfield, Ohio.
Litchfield, Ill.
Birmingham, Ala.
Bremen, Ind.
Kansas City, Mo.
Bayonne, N. J.

Warehouses are located in the following cities:

New York,
Bayonne,
Boston,
Providence,
Portland (Me.)
New Haven
Philadelphia
Baltimore
Washington
Richmond
Birmingham
Buffalo
Pittsburgh
Detroit
Cincinnati
Chicago
Milwaukee
St. Louis
St. Paul
Omaha
Kansas City
Denver
San Francisco
Seattle

The Right and Left Threaded Nipple



The secret of a perfect radiator

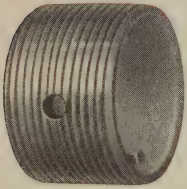
American Radiators are all made in the one best way; namely, with the right and left Threaded Nipple construction.

The Threaded Nipple represents an unseen, extra value built into the radiator. It requires much more elaborate machinery than the ordinary construction and entails many additional manufacturing operations; but it is an absolute guarantee of perfect service.

A Dual Joint

The Threaded Nipple unites the advantages of the two basic types of mechanical connection, the faced and the threaded. The illustrations on the following pages show the inherent advantage of this dual joint as evidenced by test.

The first part of this test consists in boring a hole in the threaded nipple itself, thereby de-



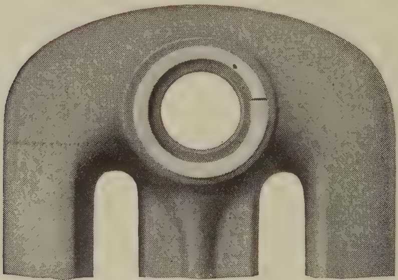
Test Nipple with hole.

stroying its ability to effect a perfectly water-tight connection, and placing the burden squarely upon the faced connection. The joint is then tested under a one-hundred pound hydrostatic pressure. The American Radiator faced connection successfully stands this test.

Then the faced connection is rendered ineffective by cutting a groove in it, as illustrated at the bottom of the page. This time a perfect threaded nipple is used, and the entire burden of securing a water-tight joint is placed upon it. The hydrostatic test is again applied.

Although each connection gives satisfactory results under these tests, both connections are combined in *all American Radiators*. Under the great test of time these radiators may be relied upon for satisfactory service.

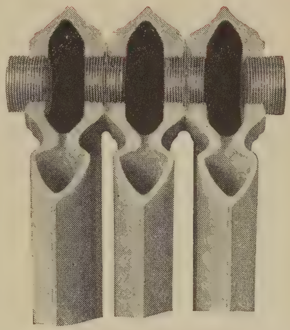
When American Radiators are installed in any building, the owner may be assured that he has the best and that permanent satisfactory ser-



Test Radiator section with groove in faced connection.

vice is guaranteed to him.

And although this special threaded nipple construction is an invisible feature, its final effect is very apparent to the eye. For holding the sections together on the inside, it eliminates the need of the ordinarily-used and



Detail view of threaded nipples in place

Illustrating the special Threaded Nipple Construction of all American Radiators

somewhat unsightly iron rod and nut construction on the outside. It holds the sections together in permanently true alignment. And it allows new sections readily to be added should the owner later decide to extend his heating system.

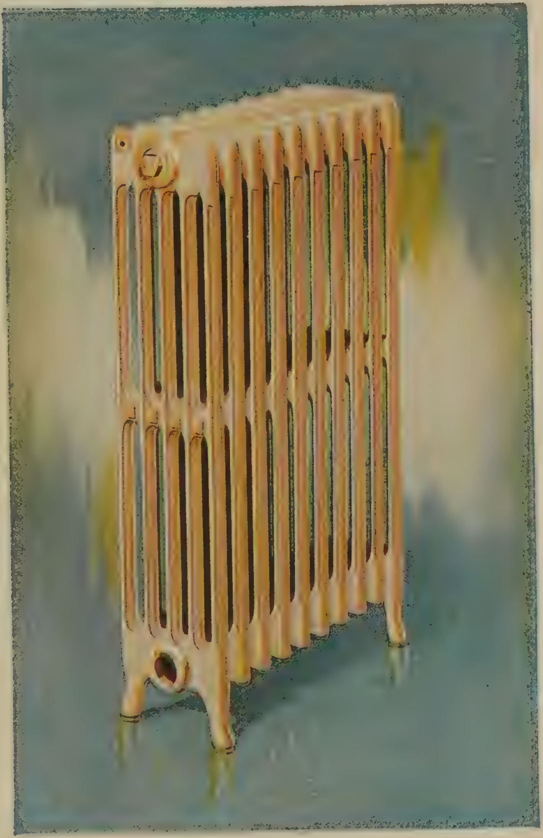
Each American Radiator is subjected to a standard hydraulic test of 85 lbs. per sq. in. Only when it is known to be perfect in every respect, is it passed for shipment.

In style and price range, the line of American Radiators is complete. There is a radiator for every need and taste.

AMERICAN RADIATORS

INDEX

CORTO RADIATORS

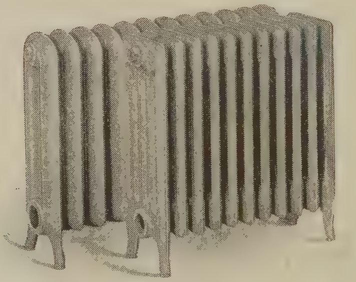


Pat'd. Sept. 4, 1917, May 10, 1921, July 19, 1921.
T. M. Corto Reg. U. S. Pat. Off.

CORTO
The Radiator Classic

Corto, the Radiator Classic, is the creation of Louis Courtot—a French artist engineer long affiliated with our Company. He labored for years to realize the ambition which he has expressed in these words:

"My ambition is to design a radiator of such refined and artistic elegance, one so repeating the chaste lines of classic architecture, that in its finished state it may justly be regarded as an object of art. It must be of lesser proportions



Showing space saved by Corto
over usual type of radiation.

than any existing radiator, yet its warming power must equal, if not exceed that of the best now known."

The Corto embodies completely each element of M. Courtot's ideal. It occupies approximately thirty per cent less space than any other radiator of similar heating power. Each year it continues to gain favor with the heating profession and among discriminating home owners.

CORTO RADIATORS

For Steam or Water

No. of Sections	* Length 2 in. per Sec.	Nominal Heating Surface—Square Feet					
		38-in. Height 4½ sq. ft. per Sec.	34½-in. Height 4 sq. ft. per Sec.	31-in. Height 3½ sq. ft. per Sec.	27-in. Height 3 sq. ft. per Sec.	23-in. Height 2½ sq. ft. per Sec.	19½-in. Height 2 sq. ft. per Sec.
2	4	9	8	7	6	5	4
3	6	13½	12	10½	9	7½	6
4	8	18	16	14	12	10	8
5	10	22½	20	17½	15	12½	10
6	12	27	24	21	18	15	12
7	14	31½	28	24½	21	17½	14
8	16	36	32	28	24	20	16
9	18	40½	36	31½	27	22½	18
10	20	45	40	35	30	25	20
11	22	49½	44	38½	33	27½	22
12	24	54	48	42	36	30	24
13	26	58½	52	45½	39	32½	26
14	28	63	56	49	42	35	28
15	30	67½	60	52½	45	37½	30
16	32	72	64	56	48	40	32
17	34	76½	68	59½	51	42½	34
18	36	81	72	63	54	45	36
19	38	85½	76	66½	57	47½	38
20	40	90	80	70	60	50	40
21	42	94½	84	73½	63	52½	42
22	44	99	88	77	66	55	44
23	46	103½	92	80½	69	57½	46
24	48	108	96	84	72	60	48
25	50	112½	100	87½	75	62½	50
26	52	117	104	91	78	65	52
27	54	121½	108	94½	81	67½	54
28	56	126	112	98	84	70	56
29	58	130½	116	101½	87	72½	58
30	60	135	120	105	90	75	60
31	62	139½	124	108½	93	77½	62
32	64	144	128	112	96	80	64

TAPPINGS: 1½ inches top and bottom and bushed for water or steam.

CONNECTIONS: Extra-heavy right and left threaded nipples.

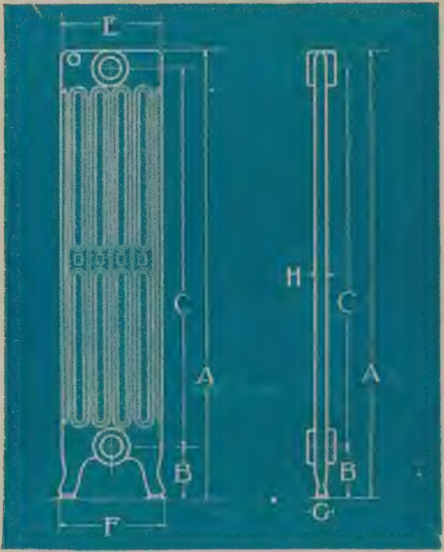
MEASUREMENTS: For center of tappings to floors and between centers of upper and lower water tappings, exact heights and widths, etc., see next page.

*Add ½ inch to length for each bushing.

Corto Radiators are furnished, upon special order, with 6-inch legs or legless.

CORTO RADIATORS

For Steam or Water



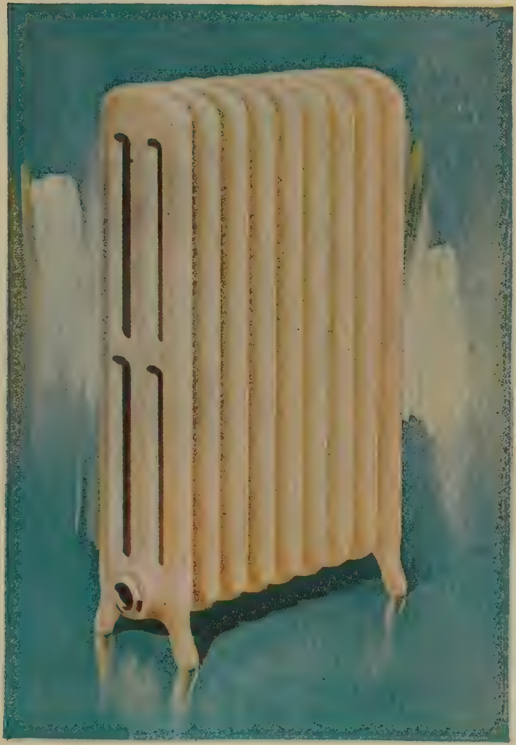
A. Total height.
B. Distance from floor to center of tapping.
C. Distance from center of top to center of bottom opening of Water Radiators.
E. Width of sections.
F. Width at feet.
G. Distance from center to center of sections.
H. Width of column.

Measurements and Tappings

Heating Surface per Section	A Inches	B Inches	C Inches	E Inches	F Inches	G Inches	H Inches
4½ ft.	37⅝	4½	$31\frac{7}{16}$	8	8⅜	2	1⅛
4 ft.	34⅜	4½	$28\frac{5}{16}$	8	8⅜	2	1⅛
3½ ft.	30⅝	4½	$24\frac{7}{16}$	8	8⅜	2	1⅛
3 ft.	26⅝	4½	$20\frac{9}{16}$	8	8⅜	2	1⅛
2½ ft.	23	4½	$16\frac{27}{32}$	8	8⅜	2	1⅛
2 ft.	19⅛	4½	$12\frac{15}{16}$	8	8⅜	2	1⅛

Distance from bottom of hub to floor on center sections of radiators is approximately $3\frac{1}{16}$ inches.

PEERLESS RADIATORS



American Peerless Radiators are the standard of merit in their field—so accepted by the heating profession, architect, and engineer.

This preeminent position is the result of the special construction according to which all American Radiators are made—the Threaded Nipple Construction—whose advantages are explained in detail on pages 91-93.

Single Column

For Steam or Water

Each section is 4½ inches wide.

Width of legs, 5½ inches.

These Radiators are made in special shapes. See pages 143-160

Single Column

For Steam or Water

No. of Sections	* Length 2½ in. per Sec.	Nominal Heating Surface—Square Feet				
		38-in. Height 3 sq. ft. per Sec.	32-in. Height 2½ sq. ft. per Sec.	26-in. Height 2 sq. ft. per Sec.	23-in. Height 1⅔ sq. ft. per Sec.	20-in. Height 1½ sq. ft. per Sec.
2	5	6	5	4	3⅓	3
3	7½	9	7½	6	5	4½
4	10	12	10	8	6⅔	6
5	12½	15	12½	10	8⅓	7½
6	15	18	15	12	10	9
7	17½	21	17½	14	11⅔	10½
8	20	24	20	16	13⅓	12
9	22½	27	22½	18	15	13½
10	25	30	25	20	16⅔	15
11	27½	33	27½	22	18⅓	16½
12	30	36	30	24	20	18
13	32½	39	32½	26	21⅔	19½
14	35	42	35	28	23⅓	21
15	37½	45	37½	30	25	22½
16	40	48	40	32	26⅔	24
17	42½	51	42½	34	28⅓	25½
18	45	54	45	36	30	27
19	47½	57	47½	38	31⅔	28½
20	50	60	50	40	33⅓	30
21	52½	63	52½	42	35	31½
22	55	66	55	44	36⅔	33
23	57½	69	57½	46	38⅓	34½
24	60	72	60	48	40	36
25	62½	75	62½	50	41⅔	37½
26	65	78	65	52	43⅓	39
27	67½	81	67½	54	45	40½
28	70	84	70	56	46⅔	42
29	72½	87	72½	58	48⅓	43½
30	75	90	75	60	50	45
31	77½	93	77½	62	51⅔	46½
32	80	96	80	64	53⅓	48

TAPPINGS:—1½ inches top and 2 inches bottom. Bushed as per list on page 111.

CONNECTIONS: Both Steam and Water—extra-heavy 1½-inch right and left threaded nipples at top and bottom.

MEASUREMENTS: For center of tappings to floors, and between centers of upper and lower Water tappings, and between upper and lower concealed brackets, exact heights and widths, etc., see pages 112 and 113.

*Add ½ inch to length for each bushing.

Two Column

For Steam and Water

Each section is 7⅜ inches wide.

Width of legs, 8½ inches.

These Radiators are made in special shapes. See pages 143-160.

Two Column

For Steam and Water

No. of Sections	* Length 2½ in. per Sec.	Nominal Heating Surface—Square Feet					
		45-in. Height 5 sq. ft. per Sec.	38-in. Height 4 sq. ft. per Sec.	32-in. Height 3⅓ sq. ft. per Sec.	26-in. Height 2⅔ sq. ft. per Sec.	23-in. Height 2⅓ sq. ft. per Sec.	20-in. Height 2 sq. ft. per Sec.
2	5	10	8	6⅔	5⅓	4⅔	4
3	7½	15	12	10	8	7	6
4	10	20	16	13⅓	10⅔	9⅓	8
5	12½	25	20	16⅔	13⅓	11⅔	10
6	15	30	24	20	16	14	12
7	17½	35	28	23⅓	18⅔	16⅓	14
8	20	40	32	26⅔	21⅓	18⅔	16
9	22½	45	36	30	24	21	18
10	25	50	40	33⅓	26⅔	23⅓	20
11	27½	55	44	36⅔	29⅓	25⅔	22
12	30	60	48	40	32	28	24
13	32½	65	52	43⅓	34⅔	30⅓	26
14	35	70	56	46⅔	37⅓	32⅔	28
15	37½	75	60	50	40	35	30
16	40	80	64	53⅓	42⅔	37⅓	32
17	42½	85	68	56⅔	45⅓	39⅔	34
18	45	90	72	60	48	42	36
19	47½	95	76	63⅓	50⅔	44⅓	38
20	50	100	80	66⅔	53⅓	46⅔	40
21	52½	105	84	70	56	49	42
22	55	110	88	73⅓	58⅔	51⅓	44
23	57½	115	92	76⅔	61⅓	53⅔	46
24	60	120	96	80	64	56	48
25	62½	125	100	83⅓	66⅔	58⅓	50
26	65	130	104	86⅔	69⅓	60⅔	52
27	67½	135	108	90	72	63	54
28	70	140	112	93⅓	74⅔	65⅓	56
29	72½	145	116	96⅔	77⅓	67⅔	58
30	75	150	120	100	80	70	60
31	77½	155	124	103⅓	82⅔	72⅓	62
32	80	160	128	106⅔	85⅓	74⅔	64

TAPPINGS: Water—1½ inches top and 2 inches bottom. Steam—2 inches at bottom only. Bushed as per list on page 111.

CONNECTIONS: Water—extra-heavy 1½-inch right and left threaded nipples at top and bottom. Steam—extra-heavy 2-inch right and left threaded nipples at bottom.

LOW DRIP HUBS: One Pipe Steam—on supply leg-section. Two Pipe Steam—on return leg-section.

MEASUREMENTS: For center of tappings to floors and between centers of upper and lower Water tappings, and between upper and lower concealed brackets, exact heights, widths, etc., see pages 112 and 113.

*Add ½ inch to length for each bushing.

Three Column

For Steam and Water

Each section is 9 inches wide.

Width of legs, 10 inches.

These Radiators are made in special shapes. See pages 143-160.

Three Column

For Steam and Water

No. of Sections	* Length 2½ in. per Sec.	Nominal Heating Surface—Square Feet					
		45-in. Height 6 sq. ft. per Sec.	38-in. Height 5 sq. ft. per Sec.	32-in. Height 4½ sq. ft. per Sec.	26-in. Height 3¾ sq. ft. per Sec.	22-in. Height 3 sq. ft. per Sec.	18-in. Height 2¼ sq. ft. per Sec.
2	5	12	10	9	7½	6	4½
3	7½	18	15	13½	11¼	9	6¾
4	10	24	20	18	15	12	9
5	12½	30	25	22½	18¾	15	11¼
6	15	36	30	27	22½	18	13½
7	17½	42	35	31½	26¼	21	15¾
8	20	48	40	36	30	24	18
9	22½	54	45	40½	33¾	27	20¼
10	25	60	50	45	37½	30	22½
11	27½	66	55	49½	41¼	33	24¾
12	30	72	60	54	45	36	27
13	32½	78	65	58½	48¾	39	29¼
14	35	84	70	63	52½	42	31½
15	37½	90	75	67½	56¼	45	33¾
16	40	96	80	72	60	48	36
17	42½	102	85	76½	63¾	51	38¼
18	45	108	90	81	67½	54	40½
19	47½	114	95	85½	71¼	57	42¾
20	50	120	100	90	75	60	45
21	52½	126	105	94½	78¾	63	47¼
22	55	132	110	99	82½	66	49½
23	57½	138	115	103½	86¼	69	51¾
24	60	144	120	108	90	72	54
25	62½	150	125	112½	93¾	75	56¼
26	65	156	130	117	97½	78	58½
27	67½	162	135	121½	101¼	81	60¾
28	70	168	140	126	105	84	63
29	72½	174	145	130½	108¾	87	65¼
30	75	180	150	135	112½	90	67½
31	77½	186	155	139½	116¼	93	69¾
32	80	192	160	144	120	96	72

TAPPINGS: Water—1½ inches top and 2 inches bottom. Steam—2 inches at bottom only. Bushed as per list on page 111.

CONNECTIONS: Water—extra-heavy 1½-inch right and left threaded nipples at top and bottom. Steam—extra-heavy 2-inch right and left threaded nipples at bottom only.

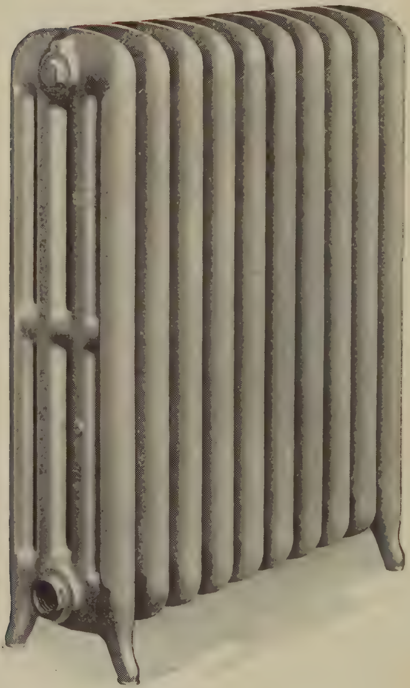
LOW DRIP HUBS: One Pipe Steam—on supply leg-section Two Pipe Steam—on return leg-section.

MEASUREMENTS: For center of tappings to floor and between centers of upper and lower Water tappings, and between upper and lower concealed brackets, exact heights and widths, etc., see pages 112 and 113.

*Add ½ inch to length for each bushing.

Four Column

For Steam or Water



Each section is 10½ inches wide. Width of legs, 11¼ inches.

Four Column

For Steam or Water

No. of Sections	* Length 3 in. per Sec.	NOMINAL HEATING SURFACE—SQUARE FEET 45-in. Height 10 sq. ft. per Sec.	38-in. Height 8 sq. ft. per Sec.	32-in. Height 6½ sq. ft. per Sec.	26-in. Height 5 sq. ft. per Sec.	22-in. Height 4 sq. ft. per Sec.	18-in. Height 3 sq. ft. per Sec.
2	6	20	16	13	10	8	6
3	9	30	24	19½	15	12	9
4	12	40	32	26	20	16	12
5	15	50	40	32½	25	20	15
6	18	60	48	39	30	24	18
7	21	70	56	45½	35	28	21
8	24	80	64	52	40	32	24
9	27	90	72	58½	45	36	27
10	30	100	80	65	50	40	30
11	33	110	88	71½	55	44	33
12	36	120	96	78	60	48	36
13	39	130	104	84½	65	52	39
14	42	140	112	91	70	56	42
15	45	150	120	97½	75	60	45
16	48	160	128	104	80	64	48
17	51	170	136	110½	85	68	51
18	54	180	144	117	90	72	54
19	57	190	152	123½	95	76	57
20	60	200	160	130	100	80	60
21	63	210	168	136½	105	84	63
22	66	220	176	143	110	88	66
23	69	230	184	149½	115	92	69
24	72	240	192	156	120	96	72
25	75	250	200	162½	125	100	75
26	78	260	208	169	130	104	78
27	81	270	216	175½	135	108	81
28	84	280	224	182	140	112	84
29	87	290	232	188½	145	116	87
30	90	300	240	195	150	120	90
31	93	310	248	201½	155	124	93
32	96	320	256	208	160	128	96

TAPPINGS: 2 inches at top and bottom. Bushed as per list on page 111.

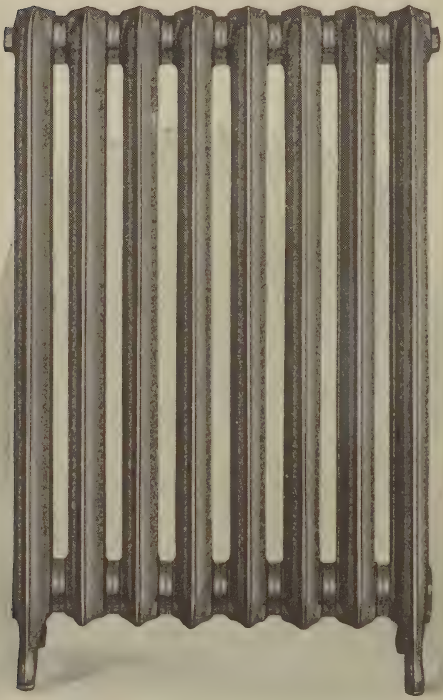
CONNECTIONS: Both Steam and Water—extra-heavy 2-inch right and left threaded nipples at top and bottom.

MEASUREMENTS: For center of tappings to floors, and between centers of upper and lower Water tappings, and between upper and lower concealed brackets, exact heights and widths, etc., see pages 112 and 113.

*Add ½ inch to length for each bushing.

Peerless Hospital Radiators

For Steam or Water



Peerless Hospital Radiators

Sanitary conditions in hospitals and sanitariums demand a radiator which is accessible for thorough cleaning. Peerless Hospital Radiators, with their well-spaced sections, comply perfectly with the demand.

For dimensions of Peerless Hospital Radiators other than shown on page 109 see dimensions of standard Peerless Radiators of same number of columns.

These Radiators are not made in special shapes but can be equipped as follows:

Legs, Extra High....................................see page 156
Concealed Brackets.............................see pages 153 to 155

For Steam or Water

One Column

No. of Sections	* Length 3 in. per Sec.	Nominal Heating Surface—Square Feet				
		38-in. Height 3 sq. ft. per Sec.	32-in. Height 2½ sq. ft. per Sec.	26-in. Height 2 sq. ft. per Sec.	23-in. Height 1⅔ sq. ft. per Sec.	20-in. Height 1½ sq. ft. per Sec.
2	5½	6	5	4	3⅓	3
3	8½	9	7½	6	5	4½
4	11½	12	10	8	6⅔	6
5	14½	15	12½	10	8⅓	7½

Two Column

No. of Sections	* Length 3 in. per Sec.	Nominal Heating Surface—Square Feet					
		45-in. Height 5 sq. ft. per Sec.	38-in. Height 4 sq. ft. per Sec.	32-in. Height 3⅓ sq. ft. per Sec.	26-in. Height 2⅔ sq. ft. per Sec.	23-in. Height 2⅓ sq. ft. per Sec.	20-in. Height 2 sq. ft. per Sec.
2	5½	10	8	6⅔	5⅓	4⅔	4
3	8½	15	12	10	8	7	6
4	11½	20	16	13⅓	10⅔	9⅓	8
5	14½	25	20	16⅔	13⅓	11⅔	10

Three Column

No. of Sections	* Length 3 in. per Sec.	Nominal Heating Surface—Square Feet					
		45-in. Height 6 sq. ft. per Sec.	38-in. Height 5 sq. ft. per Sec.	32-in. Height 4½ sq. ft. per Sec.	26-in. Height 3¾ sq. ft. per Sec.	22-in. Height 3 sq. ft. per Sec.	18-in. Height 2¼ sq. ft. per Sec.
2	5½	12	10	9	7½	6	4½
3	8½	18	15	13½	11¼	9	6¾
4	11½	24	20	18	15	12	9
5	14½	30	25	22½	18¾	15	11¼

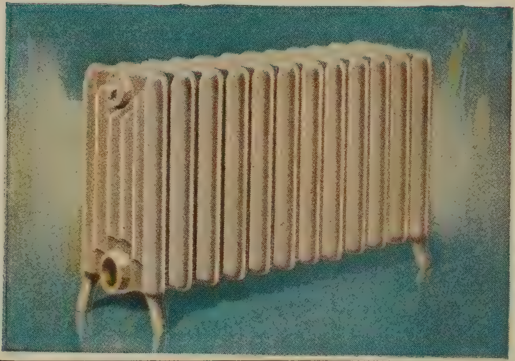
Four Column

No. of Sections	* Length 3½ in. per Sec.	Nominal Heating Surface—Square Feet					
		45-in. Height 10 sq. ft. per Sec.	38-in. Height 8 sq. ft. per Sec.	32-in. Height 6½ sq. ft. per Sec.	26-in. Height 5 sq. ft. per Sec.	22-in. Height 4 sq. ft. per Sec.	18-in. Height 3 sq. ft. per Sec.
2	6½	20	16	13	10	8	6
3	10	30	24	19½	15	12	9
4	13½	40	32	26	20	16	12
5	17	50	40	32½	25	20	15

*Add ½ inch to length for each bushing.
Sizes not limited to 5 sections, above tables being illustrative only.

PEERLESS WINDOW RADIATORS

For Steam or Water



No. of Sections	* Length 3 Inches per Section	Nominal Heating Surface—Square Feet			
		20-in. Hgt. 5 sq. ft. per Section	18-in. Hgt. 4½ sq. ft. pr. Section	16-in. Hgt. 3¾ sq. ft. pr. Section	13-in. Hgt. 3 sq. ft. per Section
2	6	10	9	7½	6
3	9	15	13½	11¼	9
4	12	20	18	15	12
5	15	25	22½	18¾	15
6	18	30	27	22½	18
7	21	35	31½	26¼	21
8	24	40	36	30	24
9	27	45	40½	33¾	27
10	30	50	45	37½	30
11	33	55	49½	41¼	33
12	36	60	54	45	36
13	39	65	58½	48¾	39
14	42	70	63	52½	42
15	45	75	67½	56¼	45
16	48	80	72	60	48
17	51	85	76½	63¾	51
18	54	90	81	67½	54
19	57	95	85½	71¼	57
20	60	100	90	75	60

Can be built up like all AMERICAN Radiators to any practical greater number of sections. To get total heating surface, multiply heating surface of section (given under height) by the number of sections in the radiator.

Each section is 12½ inches wide.

TAPPINGS: 1½ inches at top and 2 inches at bottom. Bushed as per list on page 111.

CONNECTIONS: Extra-heavy 1½-inch right and left threaded nipples at top and 2-inch nipples at bottom.

MEASUREMENTS: For center of tappings to floor, and between centers of upper and lower Water tappings, exact heights and widths, see pages 112 and 113.

For Peerless Window Radiators in Curved shape, see page 148; Corner, see pages 149-151; Extra High Legs, see page 156.

*Add ½ inch to length for each bushing.

Standard Tappings

Steam Radiators

One-Pipe Work—Supply

Up to 24 square feet, inclusive	1 -inch
Above 24, up to 60 square feet	1¼-inch
Above 60, up to 100 square feet	1½-inch
Above 100 square feet	2 -inch

Two-Pipe Work—Supply and Return

Up to 48 square feet, inclusive	1 x ¾-inch
Above 48, up to 96 square feet	1¼x1 -inch
Above 96 square feet	1½x1¼-inch

Water Radiators

Tapped for Supply and Return

Up to 40 square feet, inclusive	1 x1 -inch
Above 40, up to 72 square feet	1¼x1¼-inch
Above 72 square feet	1½x1½-inch

Air Valve and Vapor Tappings

All air-valve tappings of Direct Radiators are regularly made ⅛-inch.

Vapor tappings, top and bottom opposite ends; supply ¾-inch, return ½-inch.

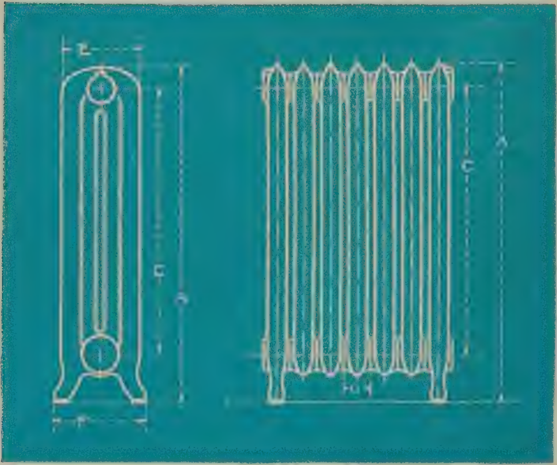
Threads of Openings

Unless otherwise ordered, all openings of Direct Radiators will have right-hand threads (except that of Wall Radiators where tapped 1½-inch, in which case tapping at one end is right-hand and left-hand on other end).

Measurements

For distances between tappings and other measurements see pages 112 and 113.

Measurements



A. Total height
C. Distance from center of top to center of bottom opening of Water Radiators.
E. Width of sections.
F. Width at feet.
G. Distance from center to center of sections.

Distance from Floor to Center of Lower Tappings
Measurements are in inches

Pattern	Water Supply and Return	Single Pipe Steam	Two-Pipe Steam	
			Supply	Return
Corto	4½	4½	4½	4½
Peerless 1-Column	4½	4	4½	4
Peerless 2-Column	4½	4	4½	4
Peerless 3-Column	4½	4	4½	4
Peerless 4-Column	4½	4½	4½	4½
Peerless Window*	3	3	3	3

Distance from bottom of hub to floor on center sections of radiators with regular height legs, is approximately 2¼ inches on 1, 2, 3 and 4-column Peerless Radiators.

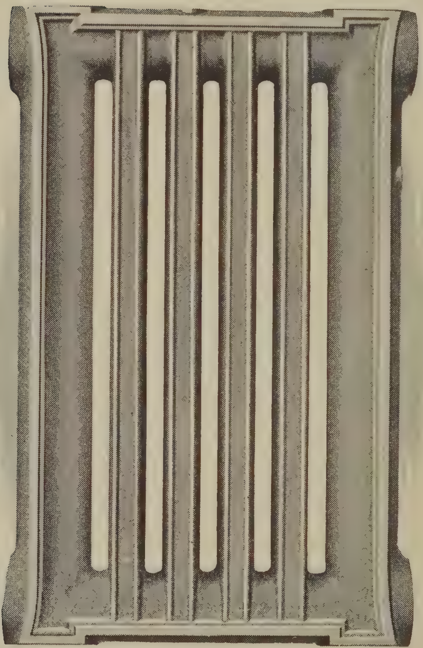
*Formerly Rococo.

Measurements

Measurements are in inches. See outline on opposite page

Pattern and Catalog Height		A	C	E	F	G	Nominal Heating Surface Sq. Ft.
Peerless One-column	38	$37\frac{13}{32}$	$31\frac{3}{32}$	$4\frac{13}{32}$	$5\frac{3}{8}$	$2\frac{1}{2}$	3
	32	$31\frac{33}{64}$	$25\frac{13}{64}$	$4\frac{13}{32}$	$5\frac{3}{8}$	$2\frac{1}{2}$	$2\frac{1}{2}$
	26	$25\frac{25}{32}$	$19\frac{15}{32}$	$4\frac{13}{32}$	$5\frac{3}{8}$	$2\frac{1}{2}$	2
	23	$22\frac{7}{8}$	$16\frac{9}{16}$	$4\frac{13}{32}$	$5\frac{3}{8}$	$2\frac{1}{2}$	$1\frac{2}{3}$
	20	$19\frac{61}{64}$	$13\frac{41}{64}$	$4\frac{13}{32}$	$5\frac{3}{8}$	$2\frac{1}{2}$	$1\frac{1}{2}$
Peerless Two-column	45	$45\frac{5}{16}$	$38\frac{25}{32}$	$7\frac{3}{8}$	$8\frac{1}{4}$	$2\frac{1}{2}$	5
	38	$37\frac{5}{8}$	$31\frac{3}{32}$	$7\frac{3}{8}$	$8\frac{1}{4}$	$2\frac{1}{2}$	4
	32	$31\frac{47}{64}$	$25\frac{13}{64}$	$7\frac{3}{8}$	$8\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{3}$
	26	26	$19\frac{15}{32}$	$7\frac{3}{8}$	$8\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{2}{3}$
	23	$23\frac{3}{32}$	$16\frac{9}{16}$	$7\frac{3}{8}$	$8\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{3}$
	20	$20\frac{11}{64}$	$13\frac{41}{64}$	$7\frac{3}{8}$	$8\frac{1}{4}$	$2\frac{1}{2}$	2
	15	15	......	$7\frac{3}{8}$	$8\frac{1}{4}$	$2\frac{1}{2}$	$1\frac{1}{2}$
Peerless Three-Column	45	$45\frac{3}{4}$	$38\frac{25}{32}$	9	$9\frac{3}{4}$	$2\frac{1}{2}$	6
	38	$38\frac{1}{16}$	$31\frac{3}{32}$	9	$9\frac{3}{4}$	$2\frac{1}{2}$	5
	32	$32\frac{11}{64}$	$25\frac{13}{64}$	9	$9\frac{3}{4}$	$2\frac{1}{2}$	$4\frac{1}{2}$
	26	$26\frac{7}{16}$	$19\frac{15}{32}$	9	$9\frac{3}{4}$	$2\frac{1}{2}$	$3\frac{3}{4}$
	22	$22\frac{3}{16}$	$15\frac{7}{32}$	9	$9\frac{3}{4}$	$2\frac{1}{2}$	3
	18	$18\frac{5}{32}$	$11\frac{3}{16}$	9	$9\frac{3}{4}$	$2\frac{1}{2}$	$2\frac{1}{4}$
Peerless Four-Column	45	$46\frac{1}{64}$	$38\frac{25}{32}$	$10\frac{1}{2}$	$11\frac{1}{4}$	3	10
	38	$38\frac{21}{64}$	$31\frac{3}{32}$	$10\frac{1}{2}$	$11\frac{1}{4}$	3	8
	32	$32\frac{7}{16}$	$25\frac{13}{64}$	$10\frac{1}{2}$	$11\frac{1}{4}$	3	$6\frac{1}{2}$
	26	$26\frac{45}{64}$	$19\frac{15}{32}$	$10\frac{1}{2}$	$11\frac{1}{4}$	3	5
	22	$22\frac{29}{64}$	$15\frac{7}{32}$	$10\frac{1}{2}$	$11\frac{1}{4}$	3	4
	18	$18\frac{27}{64}$	$11\frac{3}{16}$	$10\frac{1}{2}$	$11\frac{1}{4}$		3
Peerless Window (formerly Rococo)	20	20	$15\frac{1}{16}$	$12\frac{1}{2}$	$12\frac{1}{2}$	3	5
	18	18	$13\frac{1}{16}$	$12\frac{1}{2}$	$12\frac{1}{2}$	3	$4\frac{1}{2}$
	16	16	$11\frac{1}{32}$	$12\frac{1}{2}$	$12\frac{1}{2}$	3	$3\frac{3}{4}$
	13	13	$8\frac{1}{16}$	$12\frac{1}{2}$	$12\frac{1}{2}$	3	3

PEERLESS WALL RADIATORS



PEERLESS WALL RADIATORS

WHEREVER conditions demand maximum heating results from radiators confined in a limited space, as in factory work shops, loft buildings, storehouses, garages, lobbies, corridors, stairways, bath rooms, etc., etc., American Peerless Wall Radiators will render especially desirable service.

These radiators are made up of sections in a wide variety of sizes, with provisions for numerous groupings; and may therefore be assembled to meet any structural condition, fitting into restricted spaces of practically any size or shape, under windows or between them, on walls, ceilings or in sky-lights.

And although readily conforming in this way to limited space requirements, American Peerless Wall Radiators possess such an unusually high degree of efficiency in heating power, that adequate heating results are insured. Column radiation emits approximately 240 B.t.u. per square foot, under standard conditions; while under identical conditions, Peerless Wall Radiators emit a considerably larger amount. It is for this reason that the radiators allow their great space economy without entailing a sacrifice in heating results.

American Peerless Wall Radiators can be assembled in small or large operating units. Steam or water can be admitted into only the necessary number of units during the milder portions of the heating season, thus securing comfortable temperatures at all times with the least consumption of fuel.

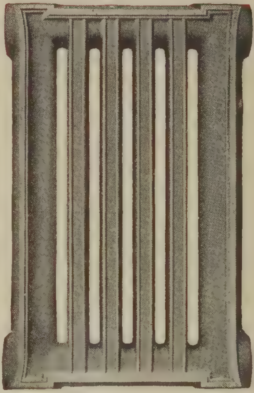
The radiators easily vent entrained air, insuring a silent, steady, dependable flow or warmth. They are perfectly adapted for the utilization of exhaust or condensed steam, so frequently available in industrial establishments.

Right and left-hand threaded hexagon nipples made of malleable iron are supplied for connecting banks of assembled radiators. This feature, combined with the convenient sections and sizes in which the radiators are manufactured and shipped, greatly reduces the time and cost of installation. And should the owner later wish to alter his structure, the radiators may be disassembled and reassembled to meet the new requirements.

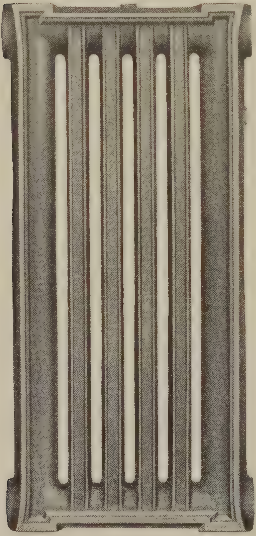
Pitting of the inner or outer surfaces is unknown. American Peerless Wall Radiators will last as long as the building they occupy, rendering permanently efficient service.

Low in their initial cost, flexible in arrangement, adaptable to space requirements, superior in heating power, and as durable as any building, American Peerless Wall Radiators may be recommended to any one as a sound and permanent property investment.

Peerless Wall Radiators should always be assembled with bars vertical to secure greatest heating efficiency. The 7- and 9-foot Sections are, therefore made in two Styles: Nos. 7-A and 9-A have bars running crosswise of the Section and are regularly tapped for connecting end to end as illustrated. Nos. 7-B and 9-B have bars running lengthwise of the Section and are regularly tapped for connecting side by side as illustrated.



No. 7-B



No. 9-B

No. 5-A is made with bars running crosswise of the Section only and is regularly tapped for connecting end to end.

On special order, the No. 5-A, 7-A and 9-A sections can be furnished with tappings at 30, 40, 70, and 80 as illustrated.

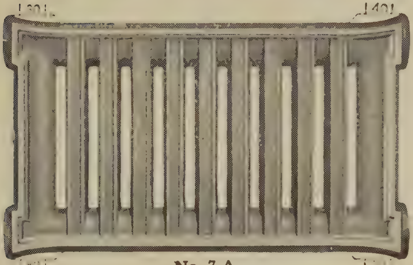
For Ratings and Measurements of Sections, see pages 117 and 119.

For Methods of Assembling, see pages 120 to 127 inclusive.

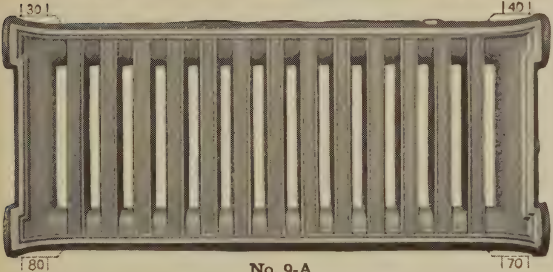
For Tappings, Connections, Directions for Ordering, and Shipping Conditions, see page 120.

PEERLESS WALL RADIATORS

No. 5-A



No. 7-A



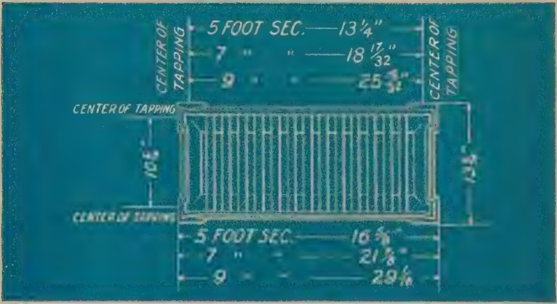
No. 9-A

Rating and Measurement of Sections

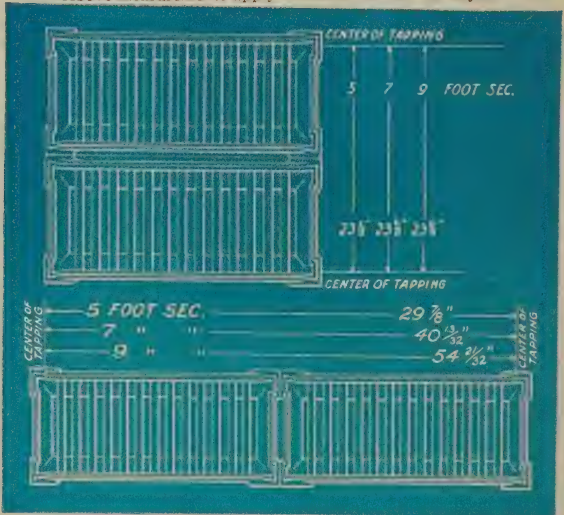
Sections Number	Height Inches	Length or Width Inches	Thickness Inches	Thickness (with Bracket) Inches	Heating Surface Sq. Ft.
5-A	$13\frac{5}{16}$	$16\frac{5}{8}$	$2\frac{7}{8}$	$3\frac{1}{2}$	5
7-A	$13\frac{5}{16}$	$21\frac{7}{8}$	$2\frac{7}{8}$	$3\frac{1}{2}$	7
7-B	$21\frac{7}{8}$	$13\frac{5}{16}$	$3\frac{1}{16}$	$3\frac{11}{16}$	7
9-A	$13\frac{5}{16}$	$29\frac{1}{16}$	$2\frac{7}{8}$	$3\frac{1}{2}$	9
9-B	$29\frac{1}{16}$	$13\frac{5}{16}$	$3\frac{1}{16}$	$3\frac{11}{16}$	9

For Regular and Special Tappings see page 120.
See page 119 for Heating Surface in length occupied.

Measurements



Above measurements apply to either "A" or "B" styles



Note.—The regular tappings of American Wall Radiators as shown on the following pages are indicated by Nos. 2, 3, 4, 5, 6, 7, 8, and 9. Nos. 20, 30, 40, 50, 60, 70, 80 and 90 indicate special tappings which can be furnished if desired and for which an extra charge will be made. Tappings are 1½ inches, supply and return, and bushed as desired. Add 1⅛ inches to length measurement for each hexagonal nipple used in assembling. See also "Directions for Ordering" page 120. For heating surface in length of space occupied, see next page.

Table Showing Length of Space Occupied — And Heating Surface for Various Sizes and Assemblages of Peerless Wall Radiators

No. of Sect.	Length of Space Occupied				Heating Surface, Square Feet		
	Type 5-A Ft. In.	Type 7-A Ft. In.	Type 9-A Ft. In.	Types 7-B, 9-B Ft. In.	Type 5	Type 7	Type 9
1	1– 4 5/8	1– 9 7/8	2– 5 1/16	1– 1 5/16	5	7	9
2	2– 9 1/4	3– 7 3/4	4–10 1/8	2– 2 5/8	10	14	18
3	4– 1 7/8	5– 5 5/8	7– 3 3/16	3– 3 15/16	15	21	27
4	5– 6 1/2	7– 3 1/2	9– 8 1/4	4– 5 1/4	20	28	36
5	6–11 1/8	9– 1 3/8	12– 1 5/16	5– 6 9/16	25	35	45
6	8– 3 3/4	10–11 1/4	14– 6 3/8	6– 7 7/8	30	42	54
7	9– 8 3/8	12– 9 1/8	16–11 7/16	7– 9 3/16	35	49	63
8	11– 1	14– 7	19– 4 1/2	8–10 1/2	40	56	72
9	12– 5 5/8	16– 4 7/8	21– 9 9/16	9–11 13/16	45	63	81
10	13–10 1/4	18– 2 3/4	24– 2 5/8	11– 1 1/8	50	70	90
11	15– 2 7/8	20– 0 5/8	26– 7 11/16	12– 2 7/16	55	77	99
12	16– 7 1/2	21–10 1/2	29– 0 3/4	13– 3 3/4	60	84	108
13	18– 0 1/8	23– 8 3/8	31– 5 13/16	14– 5 1/16	65	91	117
14	19– 4 3/4	25– 6 1/4	33–10 7/8	15– 6 3/8	70	98	126
15	20– 9 3/8	27– 4 1/8	36– 3 15/16	16– 7 11/16	75	105	135
16	22– 2	29– 2	38– 9	17– 9	80	112	144
17	23– 6 5/8	30–11 7/8	41– 2 1/16	18–10 5/16	85	119	153
18	24–11 1/4	32– 9 3/4	43– 7 1/8	19–11 5/8	90	126	162
19	26– 3 7/8	34– 7 5/8	46– 0 3/16	21– 0 15/16	95	133	171
20	27– 8 1/2	36– 5 1/2	48– 5 1/4	22– 2 1/4	100	140	180
21	29– 1 1/8	38– 3 3/8	50–10 5/16	23– 3 9/16	105	147	189
22	30– 5 3/4	40– 1 1/4	53– 3 3/8	24– 4 7/8	110	154	198
23	31–10 3/8	41–11 1/8	55– 8 7/16	25– 6 3/16	115	161	207
24	33– 3	43– 9	58– 1 1/2	26– 7 1/2	120	168	216
25	34– 7 5/8	45– 6 7/8	60– 6 9/16	27– 8 13/16	125	175	225
26	36– 0 1/4	47– 4 3/4	62–11 5/8	28–10 1/8	130	182	234

To these lengths add 1/2 inch for each end bushed and 1 1/8 inches for each Hexagon Nipple used in assembling.

Directions for Ordering

Where higher working pressures (steam or water) than 10 to 40 pounds are required, order must specifically so state. In these cases wall radiators are furnished only with outside hexagon nipples.

For convenience in handling and shipping unless otherwise ordered, No. 5-A Radiators will be assembled in stacks not exceeding 6 sections; No. 7-A Radiators in stacks not exceeding 4 sections; No. 9-A Radiators in stacks not exceeding 3 sections; and Nos. 7-B and 9-B Radiators in stacks not exceeding 7 sections.

When fitter intends to erect a stack consisting of more sections than above mentioned, or when the sections or stacks are to be set in rows or series (as shown by illustrations on pages 121 to 127), we provide a right- and left-hand threaded nipple **having hexagon nut at center**, enabling the fitter to easily connect the stacks or rows on the job.

Peerless Wall Radiation is tapped 1½-inch supply and return and bushed as desired. It is connected with 1½-inch right- and left-hand threaded internal nipples. These nipples have two heavy inside lugs so that an ordinary piece of 1-inch round iron flattened at one end the length of nipple, can be inserted to any desired point in the Radiator, and by applying an ordinary wrench to bar, the nipple can be screwed or unscrewed and one or more sections may be added or taken out independently of all the others in the stack. We can furnish these bars (Direct Radiator Wrenches) in sizes as noted on page 142.

Orders should refer to figure number showing assemblage (see pages 121 to 127.) The figures shown on these pages illustrate the common ways of assembling comparatively small units, but wall radiators can be assembled in any number of sections, either longer or higher, than shown in the figures. It is our practice, however, when a greater number of sections of a given figure than exactly shown in the figure, are specified, to always build onto the length, maintaining the height as shown in the figure. The safe way in ordering is always to send sketch unless you are ordering exactly the number of sections as shown in the figure.

Key to Figure Numbering.—The first numeral in each of the following Figure Numbers indicates the size of section, thus:—Fig. 517 means 5 foot sections arranged in the manner as shown in sketch above the number; Fig. 717 refers to 7 foot sections and to the same assemblage, and Fig. 917 refers to 9 foot sections and to the same assemblage.

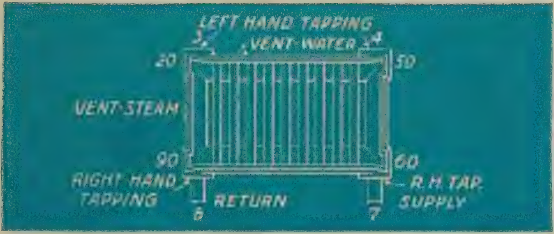


Figure 51, 71, or 91
Water and One- and Two-Pipe Steam

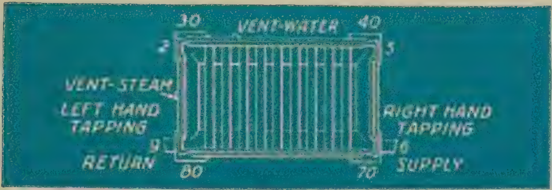


Figure 57, 77, or 97
Water and One- and Two-Pipe Steam

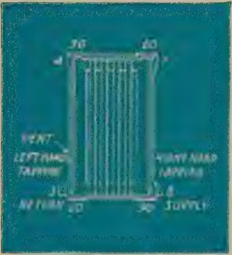


Figure 74 or 94
One- and Two-Pipe Steam

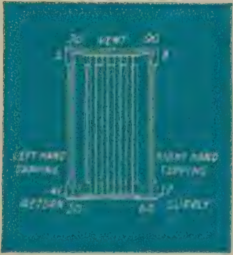


Figure 78 or 98
Water

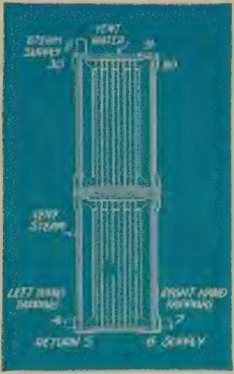


Fig. 713 or 913
Two Sections in Two Tiers—Water and 2-Pipe Steam

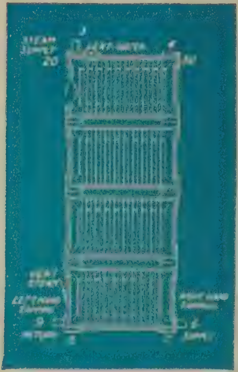


Fig. 515, 715, or 915.
Assembled Four Sections in Four Tiers—Water and Two-Pipe Steam

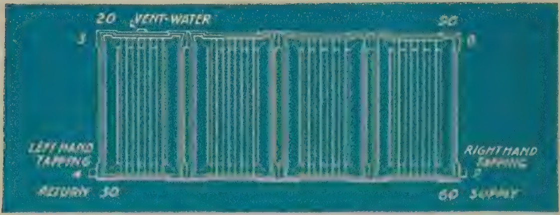


Figure 717 or 917
Assembled Four Sections in Single Tier—Water

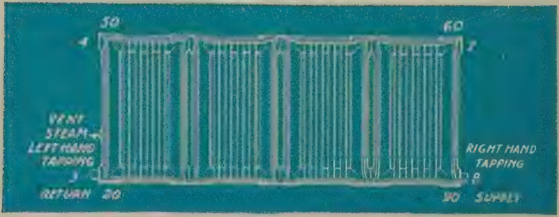


Figure 718 or 918
Sections in Single Tier—1- and 2-Pipe Steam

See note on Tappings, page 120. Also see pages 118 and 119.

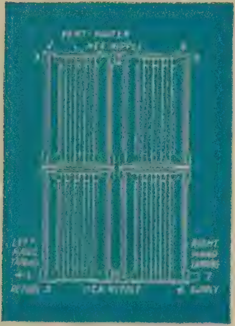


Figure 719 or 919
Assembled Four Sections
in Two Tiers—Water

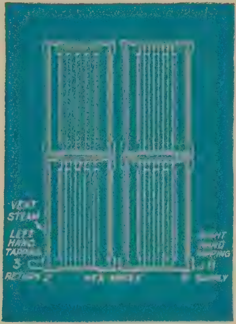


Figure 720 or 920
Assembled Four Sections in
Two Tiers—One- and
Two-Pipe Steam

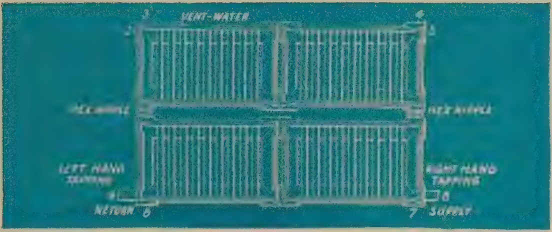


Figure 521, 721, or 921
Assembled Four Sections in Two Tiers—Water

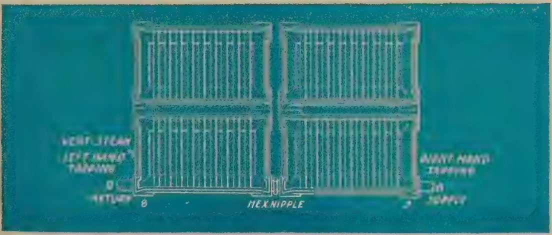


Figure 522, 722, or 922
Assembled Four Sections in Two Tiers—One- and Two-Pipe Steam

See note on Tappings, page 120. Also see pages 118 and 119.

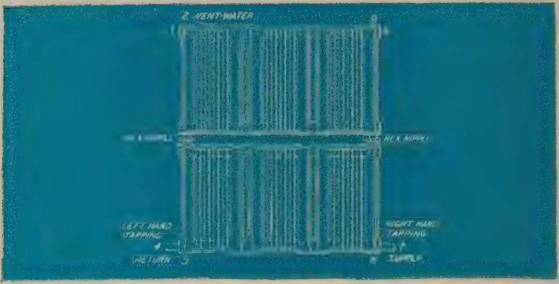


Figure 725 or 925
Assembled Six Sections in Two Tiers—Water

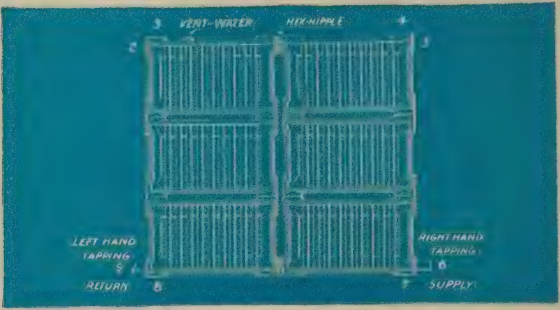


Figure 527, 727, or 927
Assembled Six Sections in Three Tiers—Water

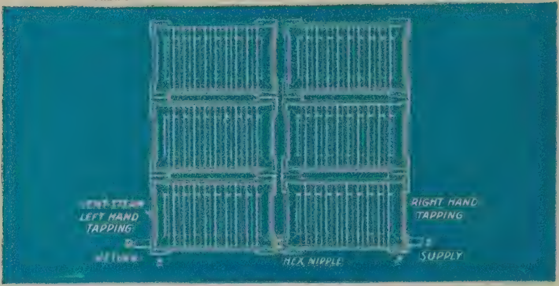


Figure 528, 728, or 928
Assembled Six Sections in Three Tiers—One- and Two-Pipe Steam

See note on Tappings, page 120. Also see pages 118 and 119.

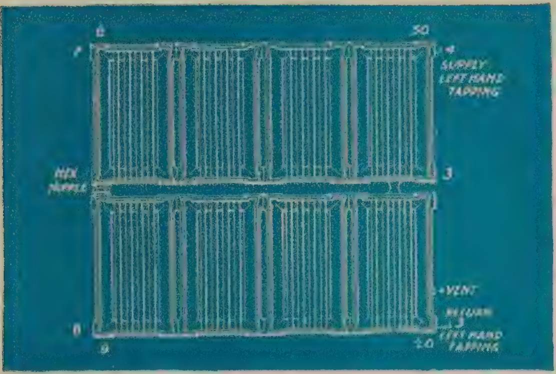


Figure 740 or 940

Assembled in Eight Sections in Two Tiers—For Two-Pipe Steam Using Spacing Saddle

For Water, Specify Figure 725.

Indicate points at which tappings are required

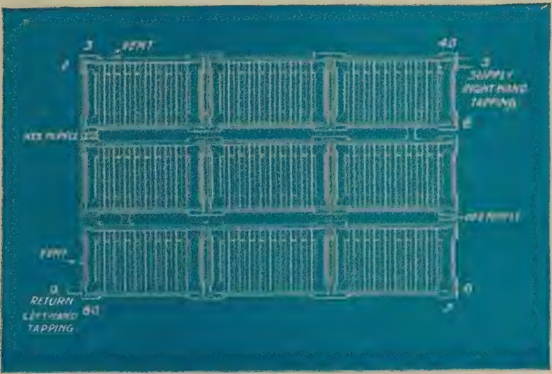


Figure 541, 741, or 941

Assembled Nine Sections in Three Tiers—Using Spacing Saddle

Indicate points at which tappings are required.

See note on Tappings, page 120. Also see page 118 and 119.

Figure 511, 711, or 911. Assembled Three Sections in Single Tier—Water and One- and Two-Pipe Steam

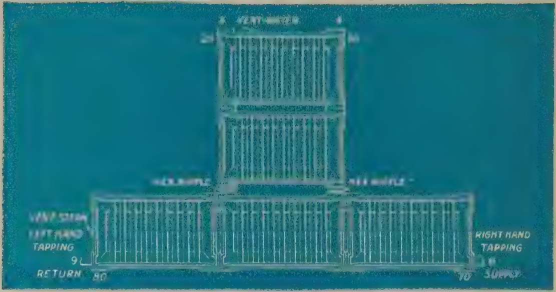


Figure 523, 723, or 923
Assembled Three and Two Sections with Three Tiers in Center—Water and One-and Two-Pipe Steam

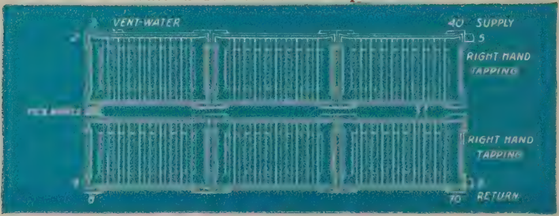


Figure 531, 731, or 931
Assembled Six Sections in Two Tiers—Water
Always indicate points at which tappings are required

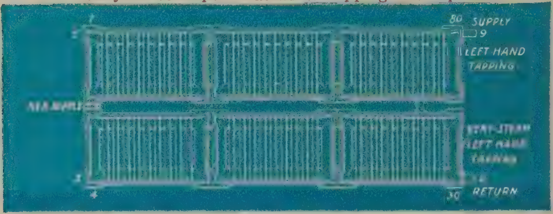


Figure 532, 732, or 932
Assembled Six Sections in Two Tiers—Two-Pipe Steam

Always indicate points at which tappings are required
See note on Tappings, page 120. Also see page 118 and 119.

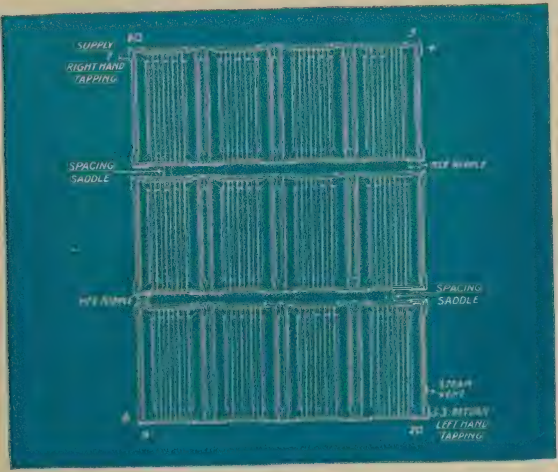


Figure 742 or 942
Assembled in Twelve Sections in Three Tiers. Using Spacing Saddles (see below)

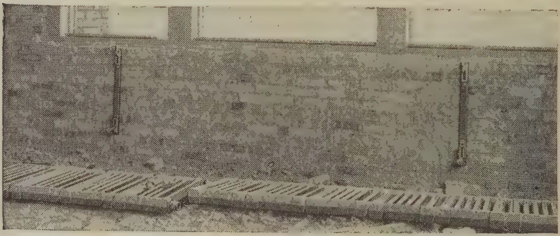
Indicate points at which tappings are required.

See note on Tappings, page 120. Also see page 119 and 120.

Wall Radiator Spacing Saddle

Furnished between sections in assemblages of Peerless Wall Radiators, similar to figure above. Saves using extra brackets. Furnished without charge.

IN a study of the cost for installation of Wall Radiation, it is ordinarily a matter of agreeable surprise to learn how cheaply AMERICAN PEERLESS Wall Radiators, with their indestructible features and low depreciation, can be installed by using Arco Adjustable Wall Brackets. There are many contractors who are installing this heating surface at the same and frequently at a less cost than for coil. This is due to the limited amount of labor required to erect an AMERICAN PEERLESS Wall Radiator unit. The contractor who systematizes finds that this lessened labor item has a material effect on the probability of his closing the contract, and also on his profits. The labor cost is largely influenced by the method of handling on the job, which is greatly facilitated by the right- and left-hand hexagon connecting nipples.

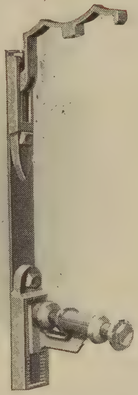


ARCO Adjustable Wall Brackets in position. Note right and left-hand hexagon nipples ready for use in connecting up two stacks of AMERICAN PEERLESS Wall Radiators.

ARCO ADJUSTABLE WALL BRACKETS

(Patented July 5, 1910; March 18, 1913)

Single spool bracket for single row of radiation



Double spool bracket for double row of radiation

Made for all runs of wall radiators in factories, warehouses, theatres, railroad stations and other buildings, garages, schools, churches and residences.

By use of these brackets, which permit vertical adjustment of 2 inches, the fitter can adjust for "pitch" after they have been attached to the wall. The brackets set the outer face of the radiator $4\frac{3}{4}$ inches from the wall.

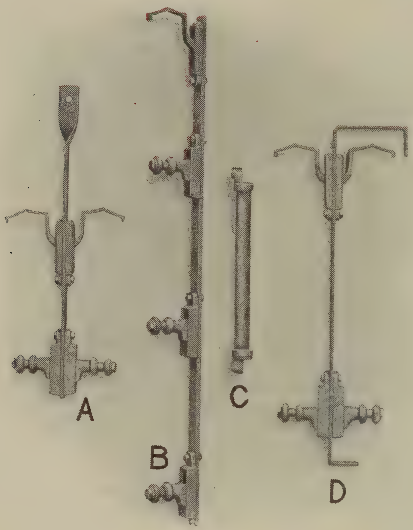
The spools on the bottom bracket allow a free horizontal movement of the radiators, thus taking care of any difference in "roughing-in" measurements, and afford free-play for expansion and contraction. The V shape formed by the divided spool fits the edges of Peerless Wall sections, thus keeping them securely in place.

The malleable iron finger of the top bracket is set at its highest point and then screwed down to the radiator, merely guiding it and keeping it from tipping forward.

On SPECIAL ORDER we furnish the Arco Brackets with two spools (see above)—to carry two runs of radiation separated for "A" section about $1\frac{7}{16}$ inch, and for "B" section $1\frac{1}{4}$ inch.

For application of new Arco Adjustable Wall Brackets to Peerless Wall Radiators and for chart showing number and location of Brackets see following pages.

When ordering state whether for use with 5, 7, or 9 square foot sections and whether of "A" or "B" pattern, giving figure number of assemblage. See pages 120 to 127. See page 132 for detail measurements.



Assemblages of ARCO Adjustable Wall Brackets

Figure "A" shows a combination Arco Adjustable Support suspended from the ceiling, permitting the duplex arrangement of the wall pattern radiators.

Figure "B" shows a multiple support used preferably with the "A" section, permitting a number of radiators to be supported one above another, the intermediate roll in each case serving the double purpose of carrying the weight of the section as well as guiding the top of the lower one.

Figure "C" shows a trapeze hanger which is used for supporting wall radiators which are hung flat and parallel to the ceiling. The end fittings are screwed into a 1-inch pipe or long nipple and the rods which extend at right angles pass through the fittings and permit a vertical adjustment.

Figure "D" shows a combination which may be used in place of the double spool support, the brackets being fastened to a bent bar and the latter bolted to the wall at the top and to the floor at the bottom.

ARCO ADJUSTABLE WALL BRACKETS

For Single Row

Graphic chart to show by perpendicular lines how many and where to place New Arco Adjustable Wall Brackets upon Radiators of different assemblages, from 5 to 30 sections. (See page 132.)

For Double Row of Radiation

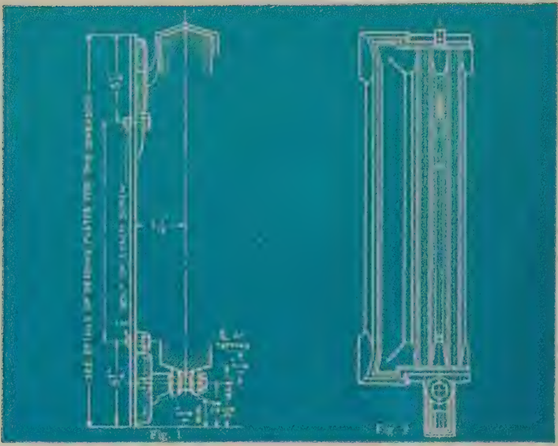
The following table gives the number of double spool Arco adjustable brackets required to support properly two rows of "B" Sections Peerless Wall Radiators:

Number of Double Sections	Number of Brackets
5 to 8	2
9 to 14	3
15 to 24	5
25 to 32	7
33 to 45	8

See Measurements of Brackets, page 132.

ARCO ADJUSTABLE WALL BRACKETS

(Patented July 5, 1910)



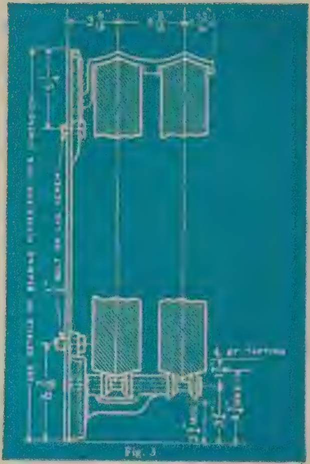
Figs. 1, 2 and 3 show construction details and measurements of Arco Adjustable Wall Brackets.

Fig. 1 illustrates Bracket for a single row of Peerless Wall Radiators.

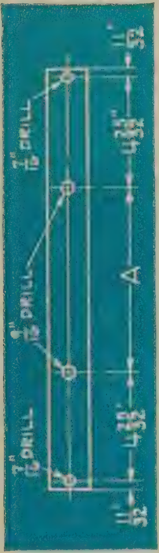
Fig. 3 illustrates Bracket for double row of Peerless Wall Radiators.

Fig. 2 illustrates appearance of either Bracket when supporting Peerless Wall Radiators.

For Bearing Plate Dimensions see next page.



Bearing Plate Dimensions



Bearing plates are first fastened to the wall after which Arco Adjustable Wall Brackets are fastened to the bearing plates.

No. 1 Bearing Plate for 5-A, 7-A and 9-A Peerless Wall Radiators as used in Assemblage Fig. 511, 711 or 911.

No. 2 Bearing Plate for 5-A Peerless Wall Radiators as used in Assemblage Fig. 517 or 518.

No. 3 Bearing Plate for 7-B Peerless Wall Radiators as used in Assemblage Fig. 717 or 718.

No. 4 Bearing Plate for 9-B Peerless Wall Radiators as used in Assemblage Fig. 917 or 918.

No. 5 Bearing Plate for 5-A, 7-A and 9-A Peerless Wall Radiators as used in Assemblage Figs. 522, 722 and 922.

No. 6 Bearing Plate for 5-A, 7-A and 9-A Peerless Wall Radiators as used in Assemblage Figs. 521, 721, or 921, 531, 731, 931, and 532, 732 and 932.

No. 7 Bearing Plate for 5-A, 7-A and 9-A Peerless Wall Radiators as used in Assemblage Figs. 527, 727, 927, 528, 728 and 928.

Dimension A

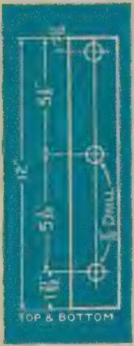
4¾ for No. 1 plate	20⅝ for No. 4 plate
8⅛ for No. 2 plate	18 for No. 5 plate
13½ for No. 3 plate	19⅛ for No. 6 plate
31¼ for No. 7 plate	

Split Bearing Plate

For 5-A, 7-A and 9-A and 7-B and 9-B Peerless Wall Radiators as used in Assemblage Figs. 713, 913, 515, 715, 915, 719, 919, 720, 920, 725, 925, 527, 727, 927, 528, 728, 928, 740, 940, 541, 741, 941, 742 and 942.

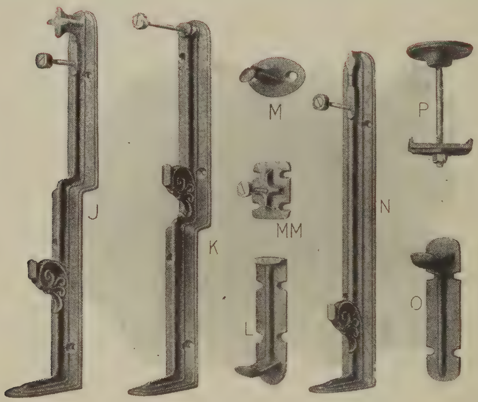
Note

For bearing Plates for double row see special catalog.



Split Bearing Plate
Top and bottom plates are identical

ARCO ADJUSTABLE WALL BRACKETS



Brackets "J": To fit over a 9½-inch high baseboard or skirting, and for supporting Wall Radiators Nos. 7-B and 9-B. With each "J" Bracket we furnish one ¼-inch stove bolt and one button.

Height from floor to center of lowest tapping (Supply or return):

J-1 Bracket.......... ....9½ inches
J-2 Bracket..7½ inches
J-3 Bracket..5½ inches

Brackets "K": To fit over baseboard or skirting, and for supporting Wall Radiators Nos. 5-A, 7-A, and 9-A. With each "K" Bracket we furnish one ¼-inch stove bolt and one button. Height from floor to center of lowest tapping (Supply or return):

K-1 Bracket	(will fit over 11½-inch high baseboard)	........16 inches
K-2 Bracket	" " " 9½ " " "	........14 inches
K-3 Bracket	" " " 7½ " " "	........12 inches
K-4 Bracket	" " " 5½ " " "	........10 inches
K-5 Bracket	" " " 3½ " " "	.... 8 inches
K-6 Bracket	" " " 1½ " " "	.... 6 inches

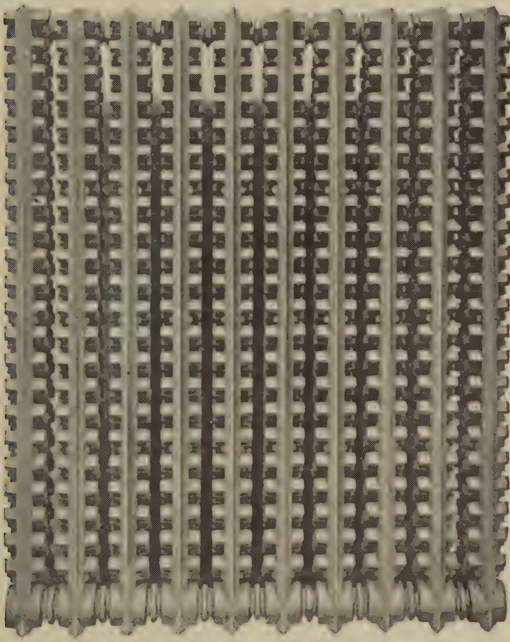
Brackets "L," "O," "MM," and "M": Screwed to wall, baseboard or wainscoting. "L" and "O" Brackets are bottom supports for all sizes of Wall Radiators. "MM" and "M" Brackets are top guides to hold radiator in place. "L" and "MM" Brackets are concealed, "O" and "M" Brackets are not. One "MM" or "M" Bracket should always be provided for use with each "L" or "O" Bracket. "L," "O," and "MM" Brackets are slotted for four, and the "M" Bracket for two wood screws—not furnished by us. With each "MM" Bracket we furnish one ¼-inch stove bolt and one button.

Bracket "N": Is a straight right angle Bracket, without offset, for supporting all sizes of Wall Radiators; height from floor to center of end tapping bosses, 5½ inches. With each "N" Bracket we furnish one ¼-inch stove bolt and one button.

Ceiling Bracket "P": Made of cast plate, 3½ inches diameter and screwed to ceiling joists by four screws—not furnished by us. The bolt furnished gives a distance of 3½ inches to 5 inches from bottom of Radiator to ceiling. Other length bolts can be furnished on special order.

Note.—In ordering buttons and stove bolts separately, state for which bracket, because of different lengths of bolts.

VENTO CAST IRON HEATER

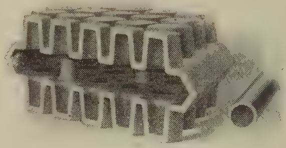


JUST as American Peerless Radiators have become the standard for direct radiator heating, so also has the Vento Cast Iron Hot Blast Heater become the standard of merit for blower and ventilation systems. For this heater is constructed according to scientific principles and the same exacting standards of manufacture that

make all American Radiators and IDEAL Boilers so acceptable and popular the world over. Vento heaters are furnishing satisfactory heating and ventilating service in thousands of large and small buildings, such as schools, churches, stores, banks, hospitals, hotels, clubs, theatres, auditoriums, libraries, etc.—wherever people are accustomed to congregate in large numbers.

These heaters are unequaled in operating efficiency. Internal currents of steam or hot water carry the heat through the hollow iron heating spaces shown in the illustration, while the exterior surfaces are very carefully designed to effect the maximum rubbing contact with the air and therefore the greatest possible heat transfer per square foot of surface. The warmed air is distributed at genial temperatures through the building.

Vento Heaters are shipped in blocks of sections, easily handled. Sections consist of only three parts, one main casting and two hexagon nipples. They may be carried through doors, windows or ordinary openings and may be quickly assembled. A considerable saving in labor is thus effected.



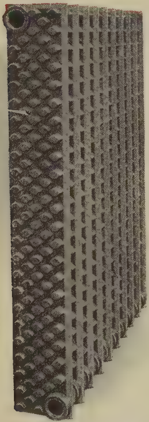
Comparative Cross-Section View of VENTO section and a 1-inch pipe

And the sections do not corrode or rust by the action of steam, water or air, but serve efficiently throughout the life of the building in which they are installed. In durability, as in efficiency, Vento Cast Iron Heaters are the best investment for property owners.

Complete description of Vento Heaters is contained in books "Ventilation by Vento Heaters" and "Engineers Data on Vento Heaters."

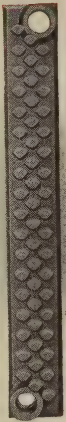
VENTO CAST-IRON HEATERS

For Fan or Blower Work

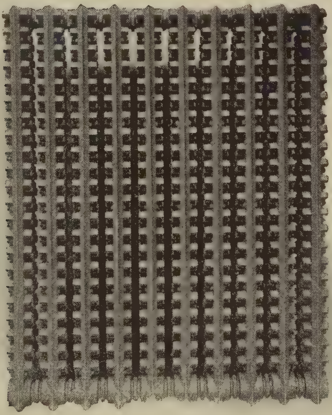


Regular Section

Cross Section



Narrow Section

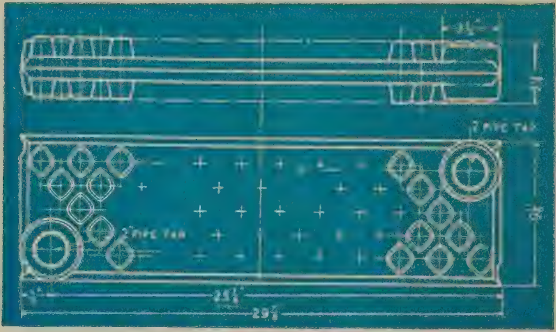


Front View of Ten-Section Stack

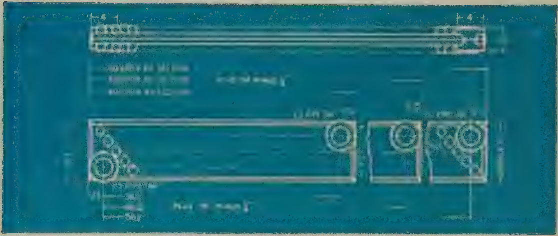
Sections are easily handled and transported and may be carried through doors or windows of any building, and can then be assembled in compact, complete heaters. The equivalent pipe coil stacks are cumbersome and difficult to handle and transport.

All details given in special catalogs.

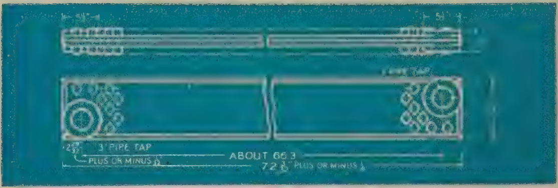
NARROW SECTIONS	Sq. Ft. per Section	Height	Width
40 inch	7.5	41 $\frac{1}{64}$	6¾
50 inch	9.5	50 $\frac{29}{32}$	6¾
60 inch	11.	60 $\frac{11}{16}$	6¾
REGULAR SECTIONS	**Sq. Ft. per Section**	**Height**	**Width**
30 inch	8.0	30	9⅛
40 inch	10.75	41 $\frac{1}{64}$	9⅛
50 inch	13.5	50 $\frac{29}{32}$	9⅛
60 inch	16.0	60 $\frac{11}{16}$	9⅛
72 inch	19.0	72	9⅛



30 Inch Vento Section



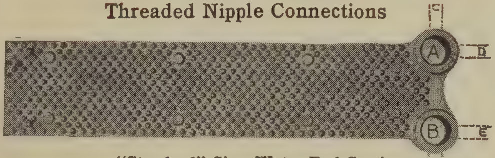
40, 50 and 60 Inch Vento Sections



72 Inch Section

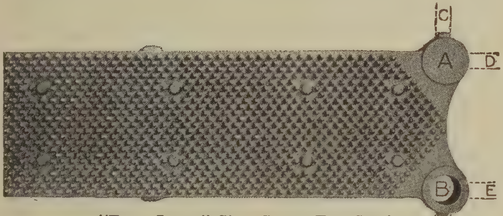
Perfection Pin

For Steam and Water—
Threaded Nipple Connections



"Standard" Size, Water End Section

MEASUREMENTS: Heating surface, 10 square feet. Length, 36¼ inches. Height, 7½ inches—at connecting point 9 13/16 inches. Width in stack, 2¾ inches. On **Special Order** we furnish nipples to make distance center to center of sections in stack, 3, 3¼, 3½, or 3¾ inches.



"Extra Large" Size, Steam End Section

MEASUREMENTS: Heating surface, 15 square feet. Length, 36¼ inches. Height, 11½ inches—at connecting point 14 inches. Width in stack, 2⅞ inches. On **Special Order** we furnish nipples to make distance center to center of sections in stack, 3⅛, 3⅜, 3⅝, or 3⅞ inches.

Both Sizes

CONSTRUCTION: Both "Standard" and "Extra-Large" sections are made in distinctive patterns for Steam and Water. The Steam patterns have one connection or passageway for Steam—the Water patterns have two connections or waterways.

TAPPINGS: 2 inches right-hand on one side, left-hand on other side. Unless otherwise ordered the inside tappings in bushings will be right-hand. **Air Valve Tap**—⅜-inch.

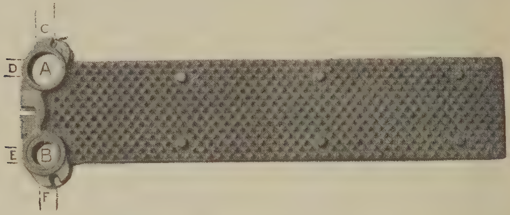
SPECIAL TAPPINGS: If other than regular tappings ("A" and "B" for water and "B" only for steam) are desired, we can furnish on the Standard size section special tappings 1¼ inches or smaller, at "C," "F," "D," and "E," and for steam section 2 inches or smaller at "A." On the Extra Large section, can furnish special tappings 2 inches or smaller at "B," "C," "D," and "F," and at "A" on the steam section.

CONNECTIONS: Extra-heavy 2-inch right and left threaded nipples with hexagon nut in center.

SHIPMENTS: Water sections separate unless ordered assembled in stacks of 5 or 6 sections; steam sections cannot be safely shipped assembled and are therefore shipped knocked down. Sufficient nipples are shipped to assemble.

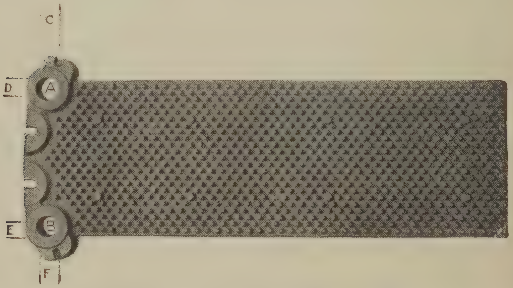
Perfection Pin

For Steam or Water—Flange and Bolt Connections



"Standard" Size Steam End Section

MEASUREMENTS: Standard Size—Heating surface, 10 square feet. Length, 36¼ inches. Height, 7½ inches—at connecting point 11½ inches. Width in stack, 2¾ inches.



"Extra Large" Size Steam End Section

MEASUREMENTS: Extra Large Size—Heating surface, 15 square feet. Length, 36¼ inches. Height, 11½ inches—at connecting point, 15½ inches. Width in stack, 2⅞ inches.

Both Sizes

CONSTRUCTION: Made in one type for either steam or water—with openings at both top and bottom.

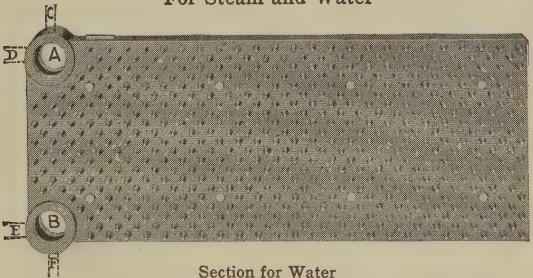
TAPPINGS: 2 inches, right-hand threads, unless otherwise ordered. Air Valve Tap—⅜-inch.

SPECIAL TAPPINGS: If other than regular tappings ("A" and "B" on water, and "B" only on steam) are desired, we can furnish special tappings 1¼ inches or smaller at "C," or "F," "D," and "E," and for steam 2 inches or smaller at "A."

SHIPMENTS: Always separately; cannot be shipped assembled. Sufficient bolts are sent to assemble.

Sanitary School Pin

For Steam and Water



Section for Water

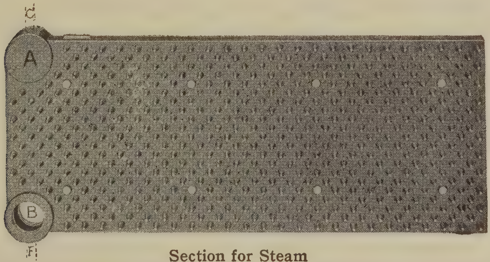
CONSTRUCTION: These sections are made in distinctive patterns for Steam and Water. The Steam patterns have one connection or passageway for steam. The Water pattern has two connections or waterways.

MEASUREMENTS: Heating surface, 20 square feet. Length with regular tappings, 36⅛ inches—when tapping is at "D" or "E," 36⅜ inches. Height, 13⅞ inches; height at connecting point with regular tappings, 15¼ inches—with special tappings at "C" or "F," 15½ inches. Width—each section in stack, 4 inches. On **Special Order,** we furnish nipples to make distances center to center in stack 3¾, 4¼, or 4½ inches.

TAPPINGS: 2 inches, right-hand on supply end; left-hand on return end. Unless otherwise ordered the inside tappings of bushings will be right-hand. **Air Valve Tap**—⅜-inch.

CONNECTIONS: Extra-heavy 2-inch right and left threaded nipples with hexagon nut at center.

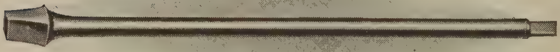
SHIPMENTS: Steam sections always separate; Water sections separate, but when so specified Water sections can be shipped in five or six section stacks. Sufficient nipples are sent to assemble.



Section for Steam

NOTE, Special Tappings: If other than regular tappings ("A" and "B" on water section and "B" only on steam section) are desired, we can furnish special tappings 2 inches or smaller, at "C," "D," "E," and "F," and also at "A" on the steam section.

Direct Radiator Wrench

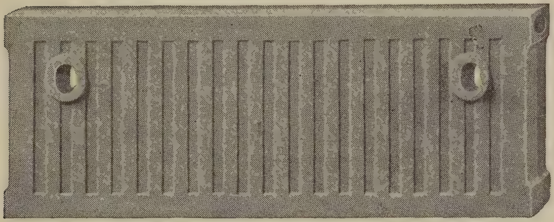


These steel wrenches are made especially for assembling or disassembling direct Radiators connected with right- and left-hand threaded nipples. Made in two sizes—for 1½-inch and 2-inch nipples and in three lengths—1-foot, 2-foot, and 4-foot (carried in stock at all Warehouses).

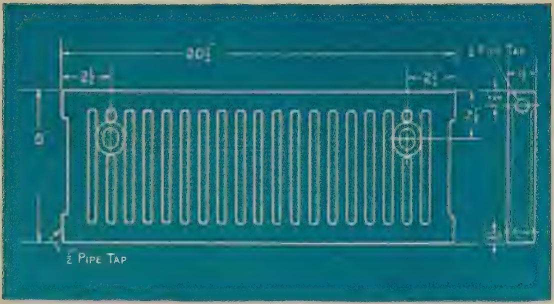
Vento and Indirect Radiator Wrench

These drop-forged steel wrenches are made especially for assembling Vento and Indirect Radiators connected with right- and left-hand threaded nipples having hexagon nut at center. Made for 1½- 2-, 2½- or 3-inch nipple openings.

PEERLESS BATHROOM RADIATOR

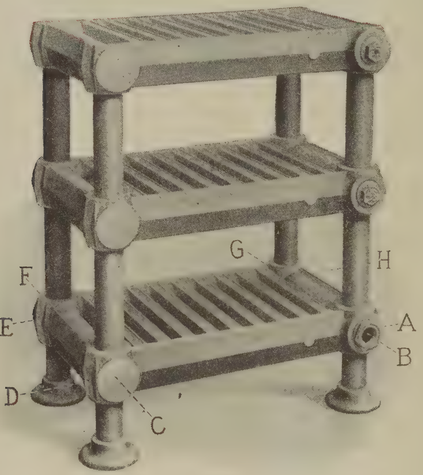


The Peerless Bathroom Radiator is designed especially for the warming of modern bathrooms, such as are found in hotels, apartments, etc. The space available for radiation in such rooms is so limited that the Peerless Bathroom Radiator fills a long felt need. This efficient radiator is easily fastened to the wall under the wash basin by simple lag screws or hooks. When harmoniously enameled its appearance is most pleasing.



Heating Surface, 3½ sq. ft. Wall Area, 1.15 sq. ft.
Two ½ inch Tappings.

For Steam or Water



This Radiator and Plate-warmer combined is made up from Peerless Wall Sections (7-foot only)—for Steam or Water.

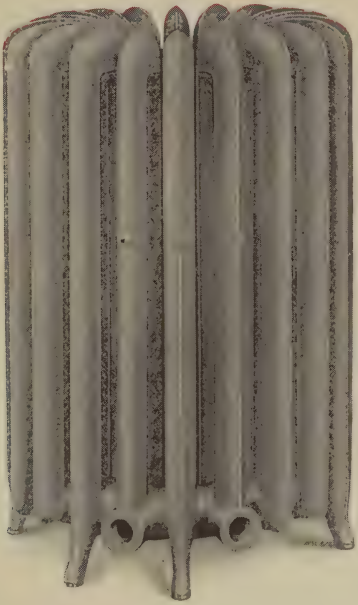
It is not only handy for residence pantries, but in extended constructions this warmer will be found most adaptable to the needs of hotel and restaurant kitchens wherein it is necessary to keep a large number of plates and other dishes warm and ready for service. It can be made up in various heights. It is shipped made up.

Sizes and Measurements

No.	Height Inches	Length Inches	Width Inches	Heating Surface
2	17	23	13¼	15 sq. ft.
3	27	23	13¼	23 " "
4	37	23	13¼	31 " "
5	47	23	13¼	39 " "

Height, floor to bottom of lower section....................4 inches.
Distance from floor to center of tapping bottom section.....5¾ inches.

TAPPINGS: Tapped regularly 1½ inches and bushed. In ordering, state whether for Steam or Water, and what size tapping is required; also in specifying locations of tappings, note same by alphabetical designations shown in illustration, and state what section is to be tapped. "B" and "F" are the regular tappings on each section, the others are special cast solid.



Peerless Two-Column Circular Radiator

Made in all heights of following patterns in steam and water:

Peerless Two-Column
Peerless Three-Column

These Radiators are made at Pierce and Detroit Plants except the twelve-section, which is made at Detroit Plant. Peerless One-Column, made steam or water, is made at Pierce Plant only.

All patterns of Circular Radiators made on special order only.

For measurements, see page 146 and 147.

Notes on Construction

Circular Radiators are made in patterns and heights as listed on pages 101, 103 and 105.

TAPPINGS: Two- and three-column Radiators are tapped 2 inches and bushed as per list on page 111. Single-column cannot be tapped larger than 1½ inches. For one-pipe work this Radiator has two tappings for valves; for two-pipe work and for Water it has four tappings for valves—two supply in front and two return in back.

CONNECTIONS: Extra-heavy right and left threaded nipples.

PUTTING TOGETHER: Circular Radiators are furnished in two pieces. When above Circular Radiators (for Steam only) are not intended to be placed around a column or post, they can, when specially ordered, be furnished all in one piece, having two connections for valves for two-pipe work. One-piece Circular Radiators are not supplied for one-pipe Steam, as the drainage would be unsatisfactory. Where Circular Radiators are used in connection with one-pipe system, each half of the circle should be connected as an independent Radiator. All Circular Water Radiators are made in two pieces.

SPACE FOR VALVES: In order to give more space for adjusting valves the sections of all Circular Steam and Water Radiators having supply and return openings are separated by an intermediate section without tapping boss, as shown in illustration.

Distance from floor to center of either supply or return tapping is 4 inches.

Circular Radiators can be made to work as one Radiator single-pipe system, by use of elbows and tee.

PEERLESS CIRCULAR RADIATORS

Peerless Single Column*—Steam or Water

No. of Sections	Outside Diameter at Legs	Inside Diameter at Legs	No. of Sections	Outside Diameter at Legs	Inside Diameter at Legs
16	20¾	8¾	40	38	26
18	22¼	10¼	42	39½	27½
20	23⅝	11⅝	44	40⅞	28⅞
22	25⅛	13⅛	46	42⅜	30⅜
24	26½	14½	48	43¾	31¾
26	28	16	50	45¼	33¼
28	29⅜	17⅜	52	46⅝	34⅝
30	30⅞	18⅞	54	48⅛	36⅛
32	32¼	20¼	56	49½	37½
34	33¾	21¾	58	51	39
36	35⅛	23⅛	60	52⅜	40⅜
38	36⅝	24⅝			

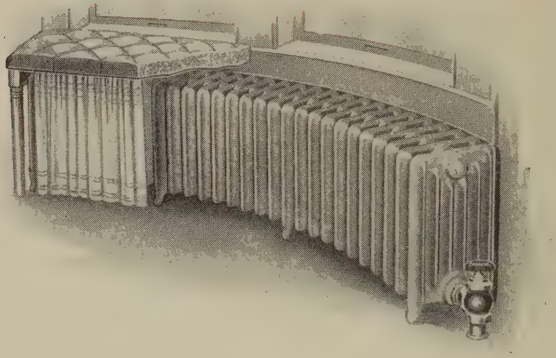
Peerless Two-Column—Steam and Water

†12	20⅞	2⅞	38	39⅝	21⅝
16	23¾	5¾	40	41	23
18	25¼	7¼	42	42½	24½
20	26⅝	8⅝	44	43⅞	25⅞
22	28⅛	10⅛	46	45⅜	27⅜
24	29½	11½	48	46¾	28¾
26	31	13	50	48¼	30¼
28	32⅜	14⅜	52	49⅝	31⅝
30	33⅞	15⅞	54	51⅛	33⅛
32	35¼	17¼	56	52½	34½
34	36¾	18¾	58	54	36
36	38⅛	20⅛	60	55⅜	37⅜

Peerless Three-Column—Steam and Water

†12	24	3	38	41⅛	20⅛
14	25¼	4¼	40	42½	21½
16	26⅝	5⅝	42	43¾	22¾
18	28	7	44	45	24
20	29¼	8¼	46	46⅜	25⅜
22	30½	9½	48	47¾	26¾
24	31⅞	10⅞	50	49	28
26	33¼	12¼	52	50⅜	29⅜
28	34½	13½	54	51¾	30¾
30	35⅞	14⅞	56	53	32
32	37¼	16¼	58	54¼	33¼
34	38½	17½	60	55⅝	34⅝
36	39¾	18¾			

*Made at Pierce Plant only.
†Made at Detroit Plant only.



Peerless Curved Window Radiator shown partially covered by a Window Seat

Curved Radiators are made for Steam and Water in all heights of patterns as follows:

Peerless Two Column

Peerless Three Column

Peerless Window, and Peerless Single Column, made steam or water in all heights of patterns.

NOTE.—Where Radiators are covered by seats, curtains, shields, etc., this fact is to be taken into account in estimating quantity of radiation required for proper service.

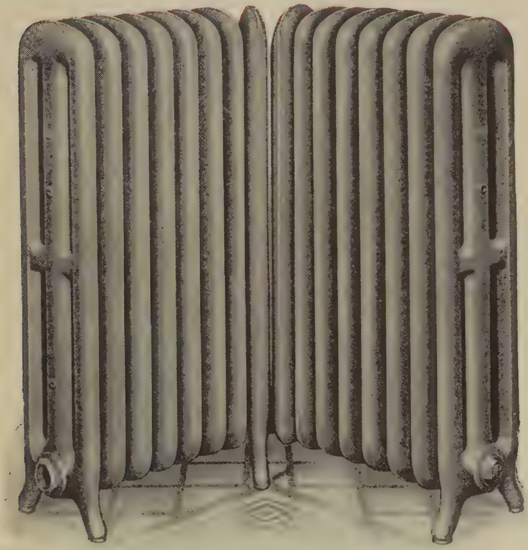
NOTE.—In ordering Curved or Corner Radiators, specify the exact radius or angle of the baseboard within which the Radiator is to be placed. See pages 150 and 151.

It is important that a heavy paper template showing exact size and radius of each Curved Radiator shall accompany the order.

NOTE.—Always advise from which end of the curve (right- or left-hand, when facing the Radiator) the supply is to be taken.

On all above Radiators, except **Peerless** Window, for one-pipe Steam work the supply-leg is constructed with low drip hub, and for two-pipe Steam work the return-leg section is constructed with low drip hub.

CORNER AND 45° ANGLE RADIATORS



Corner Radiators are made in all heights of the following patterns:

Peerless Window, Steam or Water.

Peerless Two and Three Column, Steam and Water.

Peerless One Column, Steam or Water.

For instructions in ordering, see page 150.

Forty-five degree Angle Radiators are made in all heights of the following patterns:

Peerless Window, Steam or Water.

Peerless Two and Three Column, Steam and Water.

Peerless One Column, Steam or Water.

For instructions in ordering, see page 151.

Note—For Steam indicate which end is to have supply tapping. Connected with right- and left-hand extra-heavy threaded nipples.

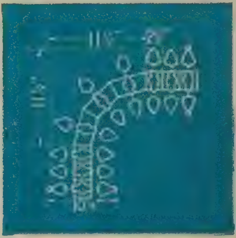
CORNER RADIATOR MEASUREMENTS

In ordering Corner Radiators give number of sections in corner and number of sections in each arm, also state which arm, looking into corner, has the supply leg.

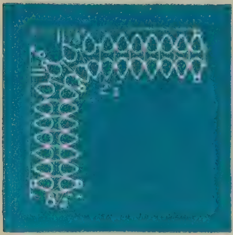
In all heights of Curved and Corner Steam Radiators, owing to the difference in heights of supply and return end tappings from floor, we must know (by sketch) which end of Radiator is for supply and which for return as you face the inside of angle or curve.

In estimating length of Radiators allow ½ inch for each bushing.

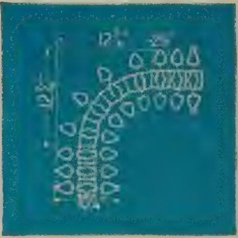
Measurements for Peerless Single-Column Steam Corner Radiators (4 sections to make corner). For heights and heating surfaces of sections see page 101.



Measurements for Peerless Three-Column Corner Radiators, for Steam and Water (3 sections to make corner). For heights and heating surfaces of section, see page 105.



Measurements for Peerless Two Column Steam Corner Radiators (4 sections to make corner). For heights and heating surfaces of sections, see page 103.

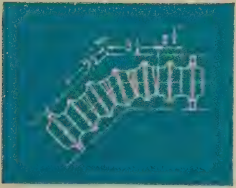


Measurements for Peerless Three-Column Corner Radiators, for Steam and Water (4 sections to make corner). For heights and heating surfaces of sections, see page 105.

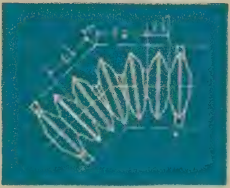
45° ANGLE RADIATOR MEASUREMENTS

For Radiators as used in bay windows, etc.

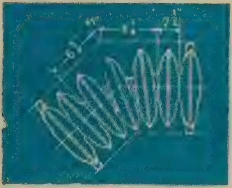
In all types and heights in which 45° Angle Radiators are made (as shown below) there are three sections in the angle.



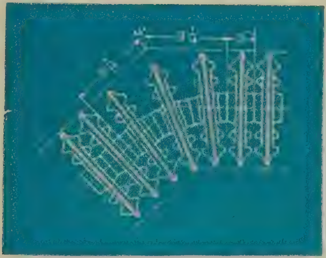
Measurements for Peerless Single-Column Steam Angle Radiators. For heights and heating surfaces of sections, see page 101.



Measurements for Peerless Two-Column Steam Angle Radiators. For heights and heating surfaces of sections, see page 103.

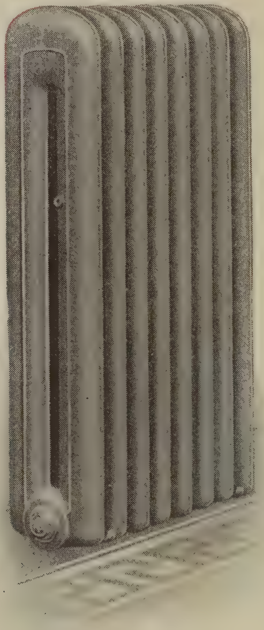


Measurements for Peerless Three-Column Steam and Water Angle Radiators. For Heights and heating surfaces, see page 105.



Measurements for Peerless Window Angle Radiators for Steam or Hot Water. For heights and heating surfaces of sections, see page 110.

For Steam and Water



Peerless One, Two, Three and Four Column Radiators can be fitted with these Brackets on special orders. Radiators to be hung on Concealed Brackets are not equipped with low drip hub.

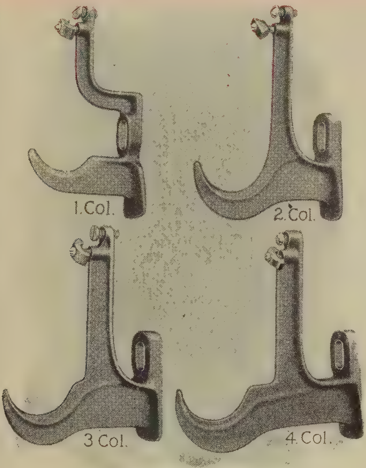
Orders for Radiators without legs must specify whether or not brackets are wanted, and if they are wanted, how many pairs.

The same data, as regards heating surface, threading, nipple connection and tapping, applies to these patterns as to Radiators having feet.

For measurements of brackets and of distances between upper and lower brackets, see pages 154 and 155.

NOTE.—Radiators to be hung on Concealed Brackets are not equipped with low drip hub.

PEERLESS RADIATOR BRACKETS



Made of Malleable Iron

Made for **1-,** 2-, 3-, and 4-column radiators, for Water, Steam or Vapor heating. Holds securely with only one stud bolt or lag screw with expansion bolt, thereby greatly reducing the cost of installation.

	Bracket No.	Dist. from Wall		Bracket No.	Dist. from Wall
Single Column Radiator	102 103 104 105	2″ 3″ 4″ 5″	**Three Column Radiator**	302 303 304 305	2″ 3″ 4″ 5″
Two Column Radiator	202 203 204 205	2″ 3″ 4″ 5″	**Four Column Radiator**	402 403 404 405	2″ 3″ 4″ 5″

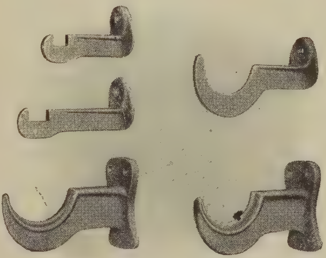
Concealed Radiator Brackets

For supporting 1-, 2-, 3-, 4-Column Direct Radiators of patterns made by us.

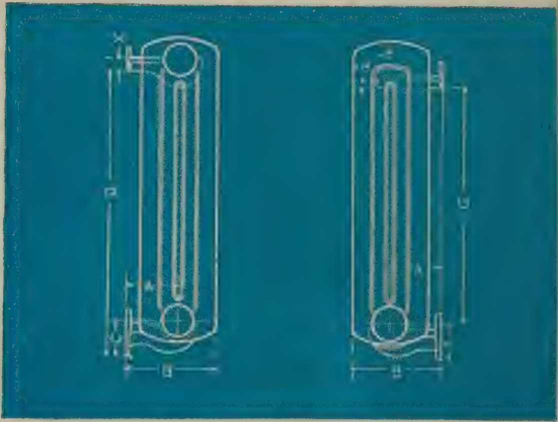
Also made for supporting Corto Radiators.

For application, see outline drawings and measurements on pages 154 and 155. A set consists of one each, top and bottom support. Ordinarily two sets will support a Radiator of medium size.

When ordering Steam Top Brackets specify whether for use on right-hand or right- and left-hand threaded nipple construction.



MEASUREMENTS



From left to right—Water Radiator; Steam Radiator, right and left threaded nipples.

Table to show Measurements in Inches in above Outline Drawings

Names of Radiators	A In.	B In.	C In.	E In.	H In.	X In.
Peerless, 1 Col.	$3\frac{1}{4}$	$5\frac{1}{2}$	$2\frac{11}{16}$	$2\frac{11}{16}$	......	$1\frac{3}{8}$
Peerless, 2 Col.	5	$8\frac{11}{16}$	$3\frac{5}{16}$	$3\frac{5}{16}$	......	$1\frac{3}{8}$
Peerless, 3 Col.	$5\frac{3}{4}$	$10\frac{1}{4}$	$3\frac{5}{16}$	$3\frac{5}{16}$	......	$1\frac{3}{8}$
Peerless, 4 Col.	$6\frac{1}{2}$	$11\frac{3}{4}$	$3\frac{5}{16}$	......	......	$1\frac{3}{8}$

	D							
	18 In.	20 In.	22 In.	23 In.	26 In.	32 In.	38 In.	45 In.
Peerless, 1 Col.	......	$14\frac{15}{16}$	......	$17\frac{7}{8}$	$20\frac{3}{4}$	$26\frac{1}{2}$	$32\frac{3}{8}$	......
Peerless, 2 Col.	......	$15\frac{19}{32}$	......	$18\frac{1}{2}$	$21\frac{13}{32}$	$27\frac{5}{32}$	$33\frac{1}{32}$	$40\frac{23}{32}$
Peerless, 3 Col.	$13\frac{1}{8}$	......	$17\frac{5}{32}$	......	$21\frac{13}{32}$	$27\frac{5}{32}$	$33\frac{1}{32}$	$40\frac{23}{32}$
Peerless, 4 Col.	$13\frac{5}{32}$	......	$17\frac{3}{16}$	......	$21\frac{7}{16}$	$27\frac{5}{32}$	$33\frac{1}{16}$	$40\frac{3}{4}$

	G							
Peerless, 1 Col.	......	$14\frac{11}{16}$	......	$17\frac{19}{32}$	$20\frac{17}{32}$	$26\frac{5}{16}$	$32\frac{1}{16}$	......
Peerless, 2 Col.	......	$15\frac{1}{4}$	......	$18\frac{5}{32}$	$21\frac{1}{16}$	$26\frac{3}{4}$	$32\frac{11}{16}$	$40\frac{7}{16}$
Peerless, 3 Col.	$12\frac{7}{8}$	......	$16\frac{15}{16}$	......	$21\frac{3}{16}$	$26\frac{29}{32}$	$32\frac{3}{4}$	$40\frac{7}{16}$

MEASUREMENTS

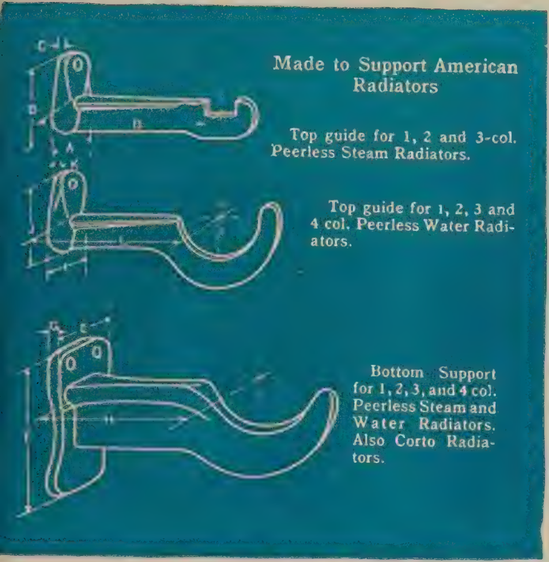


Table to show measurements in inches in above Drawings.

STEAM RADIATORS	TOP GUIDE				BOTTOM SUPPORT			
	A	B	C	D	E	F	G	H
	In.	In.	In.	In.	In.	In.	In.	In.
Single Column...	2⅛	2 9/16	11/32	3¼	2¼	3 11/16	7/16	3¼
Two Column....	2⅛	2 9/16	11/32	5	2¼	4⅜	7/16	5
Three Column...	2⅛	2 9/16	11/32	5¾	2¼	4⅜	½	5¾
Corto..........	1¾	2½	5/16	5⅜	2¼	4⅜	7/16	5⅜
WATER RADIATORS	I	J	K	L	E	F	G	H
Single Column...	2⅛	2 9/16	11/32	3¼	2¼	3 11/16	7/16	3¼
Two Column....	2⅛	2 9/16	11/32	5	2¼	4⅜	7/16	5
Three Column...	2⅛	2 9/16	11/32	5¾	2¼	4⅜	½	5¾
Four Column....	2⅛	2 9/16	11/32	6½	2¼	4⅜	½	6½
Corto..........	1¾	2½	5/16	5⅜	2¼	4⅜	7/16	5⅜

STEAM RADIATORS	M	N	O	P	D	E	F	G	H
Single Column...	2⅛	2 9/16	11/32	3¼	......	2¼	3 11/16	7/16	3¼
Two Column.....	2⅛	2 9/16	11/32	......	3⅝	2¼	4⅜	7/16	5
Three Column...	2⅛	2 9/16	11/32	3⅞	......	2¼	4⅜	½	5¾

Extra-high solid legs as shown by illustration on this page, can be furnished on special order only for all heights of radiators, so that distances from floor to center of tapping will be 6 inches. Other distances up to 8 inches, if required, will be furnished on special order only, and at additional charge. Corto Radiators can not be furnished with legs higher than 6 inches.

These Radiators with Extra-High Solid Legs are tapped 2 inches and bushed according to list on page 111.

NOTE.—In ordering Radiators having Extra-High Solid Legs, always give distance required from floor to the center of what is to be the supply tapping of Radiator.

Radiators supplied with Extra-High Solid Legs are not equipped with low drip hubs.

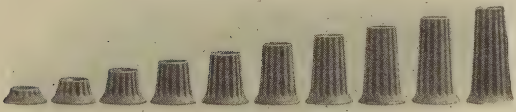
Single Foot Radiator

Radiators with front feet omitted and held in an upright position by a top bracket will be supplied by us, upon special order, in all heights of Peerless One, Two, Three, and Four-Column Radiators.

The legs are solid and can be furnished with length of legs that will make the distance from floor to center of tapping 4, 4½, 5, 6, 7, 8, or 9 inches.

For these Single Foot Radiators an additional charge will be made, prices quoted upon application.

Radiator Pedestals



Pedestals to fit under legs of all styles and heights of any of our Direct Radiators can be furnished in the following heights: ½, 1, 1½, 2, 2½, 3, 3½, 4, 4½ and 5 inches. Made at Pierce Plant.

For Ventilating Radiators

Front View—Above Base is a No. G-8-3, for a Peerless 3-Column 8-Section Radiator

These bases and corresponding front and back plates are regularly made in eleven sizes for Peerless One, Two, Three and Four-Column Radiators, as listed on page 159. They fit under regular stock AMERICAN Radiators as carried in our warehouses. For illustration of Box-Base, see page 160.

To explain the application of these Bases: A No. G-14 Box-Base is to be used for AMERICAN Radiators of 14 sections, or any even number of sections larger. A No. G-15 Box-Base is to be used for AMERICAN Radiators of 15 sections, or any odd number of sections larger.

When ordering AMERICAN Box-Bases, always specify the Serial No. of the Base as given in the table on page 159, rather than to describe the number of middle sections the Base should fit under.

The two aprons which are adjusted to the front and back of the Radiator, on top of the Base, are held in place by bolts running through the center or corners of the apron. The aprons can readily be removed for cleaning

PORTABLE VENTILATING BOX-BASES

NOTE.—Measurements are given in inches for Bases with back opening, and for bottom openings. The data on back opening Base represents outside measure of the iron flanges; the data on bottom opening Base represents the largest size openings which can be cut in the floor under the Bases for the air inlet.

Single-Column Box-Bases

Back Op'g			Bottom Op'g		
No.	Width	Length	No.	Width	Length
G- 5-1	2 13/32	5 21/32	H- 5-1	3	5
G- 6-1	2 13/32	7 25/32	H- 6-1	3	7½
G- 7-1	2 13/32	10 9/32	H- 7-1	3	10
G- 8-1	2 13/32	12 25/32	H- 8-1	3	12½
G- 9-1	2 13/32	15 11/32	H- 9-1	3	15
G-10-1	2 13/32	17 21/32	H-10-1	3	17½
G-11-1	2 13/32	20 5/32	H-11-1	3	20
G-12-1	2 13/32	22 19/32	H-12-1	3	22½
G-13-1	2 13/32	25 5/32	H-13-1	3	25
G-14-1	2 13/32	27 19/32	H-14-1	3	27½
G-15-1	2 13/32	30 1/16	H-15-1	3	30

Two-Column Box-Bases

Back Op'g			Bottom Op'g		
No.	Width	Length	No.	Width	Length
G- 5-2	2 13/16	5 9/16	H- 5-2	3½	5
G- 6-2	2 13/16	7 9/16	H- 6-2	3½	7½
G- 7-2	2 13/16	10 3/32	H- 7-2	3½	10
G- 8-2	2 13/16	12 19/32	H- 8-2	3½	12½
G- 9-2	2 13/16	15 7/32	H- 9-2	3½	15
G-10-2	2 13/16	17 21/32	H-10-2	3½	17½
G-11-2	2 13/16	20 5/32	H-11-2	3½	20
G-12-2	2 13/16	22 19/32	H-12-2	3½	22½
G-13-2	2 13/16	25 3/32	H-13-2	3½	25
G-14-2	2 13/16	27 19/32	H-14-2	3½	27½
G-15-2	2 13/16	30 1/16	H-15-2	3½	30

Three-Column Box Bases

Back Op'g			Bottom Op'g		
No.	Width	Length	No.	Width	Length
G- 5-3	2 13/16	5 9/16	H- 5-3	3½	5
G- 6-3	2 13/16	7 9/16	H- 6-3	3½	7½
G- 7-3	2 13/16	10 3/32	H- 7-3	3½	10
G- 8-3	2 13/16	12 19/32	H- 8-3	3½	12½
G- 9-3	2 13/16	15 7/32	H- 9-3	3½	15
G-10-3	2 13/16	17 21/32	H-10-3	3½	17½
G-11-3	2 13/16	20 5/32	H-11-3	3½	20
G-12-3	2 13/16	22 19/32	H-12-3	3½	22½
G-13-3	2 13/16	25 3/32	H-13-3	3½	25
G-14-3	2 13/16	27 19/32	H-14-3	3½	27½
G-15-3	2 13/16	30 1/16	H-15-3	3½	30

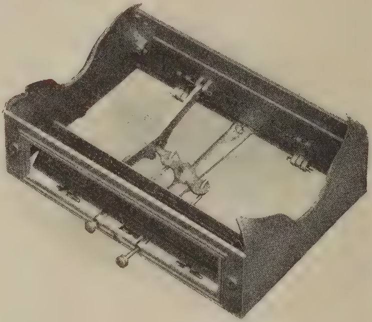
Four-Column Box-Bases

Back Op'g			Bottom Op'g		
No.	Width	Length	No.	Width	Length
G- 5-4	2 21/32	6 25/32	H- 5-4	4	6½
G- 6-4	2 21/32	9 25/32	H- 6-4	4	9½
G- 7-4	2 21/32	12 25/32	H- 7-4	4	12½
G- 8-4	2 21/32	15 25/32	H- 8-4	4	15½
G- 9-4	2 21/32	18 23/32	H- 9-4	4	18½
G-10-4	2 21/32	21 19/32	H-10-4	4	21½
G-11-4	2 21/32	24 9/16	H-11-4	4	24½
G-12-4	2 21/32	27 9/16	H-12-4	4	27½
G-1s-4	2 21/32	30 9/16	H-13-4	4	30½
G-14-4	2 21/32	33 9/16	H-14-4	4	33½
G-15-4	2 21/32	36 9/16	H-15-4	4	36½

Distance from floor to bottom of back opening is ⅜ inch.

Orders should state whether "Back Opening" or "Bottom Opening" is desired.

For Ventilating Radiators

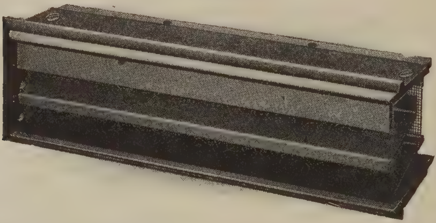


Front View—with Rear Wall Collar and Damper

In this interchangeable Base dampers work with reversible action. When front damper is open, back damper is closed, and vice versa. When front damper is open, air is taken from the room; when rear damper is open, air comes from outside. Furnished with either opening and damper in back or in the floor, as desired.

Specify whether bases are desired with regular inlet collar in rear as above shown or for inlet to come through floor.

Wall Boxes



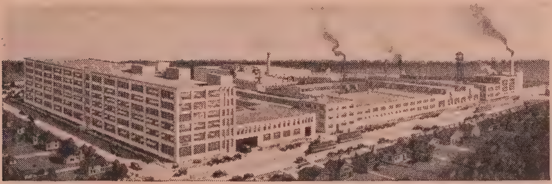
These are substantially constructed with heavy enamel finish and their angle slats and inside brass-wire screen render them storm and insect-proof. Made in two sizes.

Large Box, exclusive of flange, 8x25 ins.; including rib or flange, 8⅞x25½ ins.; depth of box from front flange to rear, 4 inches. Collar at the rear, 7⅞x24⅝ ins.

Small Box, exclusive of flange, 5x17½ ins.; including rib or flange, 5⅝x18 ins.; depth of box from front flange to rear, 4 inches. Collar at rear, 4⅞x17⅛ ins.

Bronze Wall Boxes: Made the same dimensions as Iron Wall Boxes, entirely of commercial red brass or bronze, including the deflecting plates and wire screen. Shipped in the rough unless otherwise ordered.

Valves, Regulators, and Other Heating Accessories



Detroit Lubricator Plant of American Radiator Company where IDEAL-ARCO Specialties are made.

THE production of all Specialties of our own design is grouped in this plant, which has earned a world-wide reputation for precise, quality production of lubricators, carburetors, valves, regulators, etc., and is particularly well fitted for the manufacture of high grade Heating Specialties. AIRID Air Valves, ARCO Regulators, IDEAL Packless Valves, and all accessories using the ARCO Brass Bellows are made according to the same high standards and with the same experienced supervision that has made the "Detroit" brand famous for forty years.

Perfectly operating Accessories are as important to the success of a heating plant as are perfect Boilers and Radiators. The design of IDEAL-ARCO Specialties is based on years of study of heating requirements. Their manufacture is carried on under exacting tests and inspection.

HEATING SPECIALTIES

INDEX

RADIATOR VALVES

ALL Radiator Valves described in the following pages are manufactured complete by our Detroit Lubricator Company Plant—the largest maker of Radiator Valves in the country. Years of experience in designing valves have resulted in the proper distribution of metal—strong and heavy where strength is required, yet symmetrical in appearance. Constant search for refinements has brought forth many improvements, the most recent of which are:

The use of composition non-breaking handles which retain their color and finish and do not become loose on the stem. Furnished on all valves as regular equipment.

The use of the "swinging plate" in hot water valves in place of the shell, which prevents "sticking" and hard turning. It also reduces the friction of water flow through the valve.

Special care is taken to produce smooth castings and a fine finish. All valves are thoroughly tested and inspected.

IDEAL Packless Radiator Valves

For Steam, Water, or Vapor

The developement of radiator heating equipment has brought the need for Valves that cannot leak. The stuffing box valve was originally designed for the engine room where someone was available to repack it. It must eventually give way to the leak-proof valve for radiator surroundings.

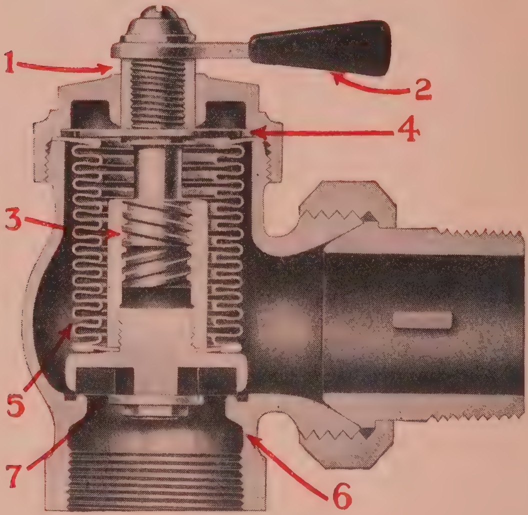
IDEAL Packless Valves contain no packing. Leakage around the stem is prevented by means of a one-piece metallic bellows, which expands and contracts as the disc is lowered or raised, but provides a permanent barrier against leaks of steam, water, or air.

The IDEAL Super-Packless Valve opens with less than one turn, yet locks tight at the seat when closed. This quick opening, easy turning feature is of particular value in homes and apartments, where women usually operate the valves.

Fractional Valves

The popularity of Vapor Heating has brought a demand for high grade Fractional valves which allow accurate control of vapor flow and also a perfect balancing of the job. Both of these prime features are secured by the Fractional valves of our manufacture.

IDEAL Fractional Packless Valve, of the bellows type, with all the easy turning, leak-proof features of the Super-Packless Valve. DETROIT Multiport Valve is a perfectly made valve of the packed type.



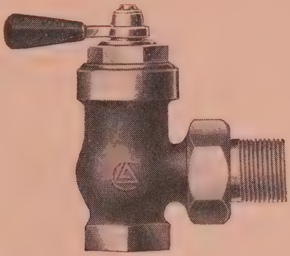
Patented May 6, 1924
Opened or Closed with One Easy Turn

For Steam, Vacuum, or Hot Water Heating

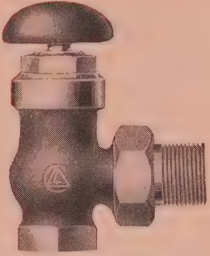
1. No packing to wear leaky. Saves packing expense at installation and annual packing cost.
2. One smooth turn opens or closes valve. Composition non-breaking handle, either lever (as shown) or round wheel type.
3. Thread free from dirt of system. No binding. Turns easily. High "lift" gives ample area for drainage.
4. Patented friction disc locks valve tight-closed. No steam-leak into radiator. Releases instantly with a touch of the handle.
5. Flexible one-piece brass bellows forms permanent barrier against leaks. Cannot wear out.
6. Circulating hole drilled at this point when used on hot water.
7. Composition disc of highest quality.

Prevents damage to floors, walls, and ceilings. Inexpensive leak insurance.

The ultimate for all radiator work.



No. 878, Angle Lever Handle

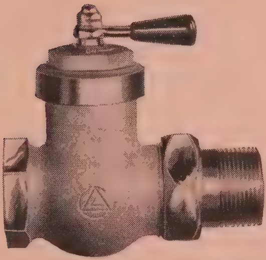


No. 888, Angle Round Handle

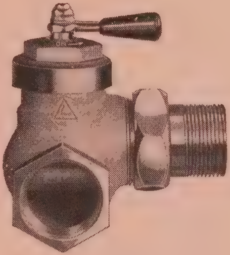
For Steam, Vacuum, or Hot Water Heating

Opened or Closed with One Easy Turn

(Patented May 6, 1924)



No. 870 Globe



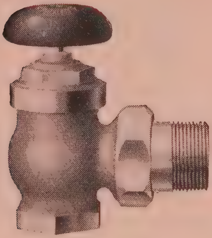
No. 879 R. H. Corner

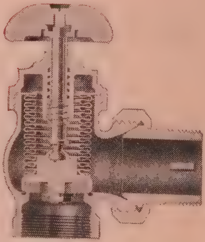
Quick opening—Packless—Locks tight against steam flow into radiator when closed. Regularly furnished with composition lever handle. Composition round handle supplied without extra charge. Not furnished in lock and shield type. Can be furnished with circulating hole for hot water. Roughing-in dimensions, page 173. Specification form, page 214.

With union, Jenkins disc, rough body plated. Right hand threads

List Prices

Size	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
Nos. 878, 888 Angle	$5.50	$5.50	$6.75	$7.75	$9.50	$13.75
No. 879 R. H. No. 880 L. H. Cor	6.00	6.00	7.25	8.50	10.50	15.00
No. 870 Globe	5.50	5.50	6.75	7.75	9.50	13.75





Angle type—Stock No. 850

For Steam, Vacuum, or Hot Water Heating

A Packless Valve of the bellows type having all the leak-proof and easy turning features of the Super-Packless Valve (page 164) but which is not quick opening. Furnished with circulating hole for hot water. Can be equipped with lock and shield. Roughing-in dimensions, page 173. Specifications form, page 214.

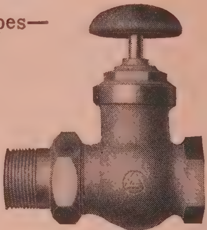
With union, Jenkins disc, rough body plated. Right hand threads.

List Prices

	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
No. 850	$5.50	$5.50	$6.75	$7.75	$9.50	$13.75

Corner and Globe types—
Nos. 851, 852, 860.

No. 851-R. H. Corner



No. 860-Globe

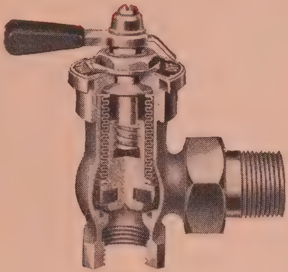
The same valve as the Angle above but with Corner and Globe bodies. Can be equipped with lock and shield. Roughing-in dimensions, page 173. Specification form, page 214.

With union, Jenkins disc, rough body plated. Right hand threads all openings.

List Prices

	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
No. 851 R.H. No. 852 L.H. Cor.	$6.00	$6.00	$7.25	$8.50	$10.50	$15.00
No. 860 Globe	5.50	5.50	6.75	7.75	9.50	13.75

IDEAL FRACTIONAL PACKLESS VALVE



Stock No. 868
Patented May 6, 1924
Bellows Type For Vapor Heating

This valve has all the advantages of the IDEAL Super-Packless Valve No. 878 (page 164) including the non-leaking metal bellows and the quick-opening easy-operating features. The air-tight bellows is of especial value on vapor systems which at times operate under vacuum. The valve has a composition disc at the seat and is equipped with the "stem locking" feature which makes it tight against leakage into the radiator when closed. It has a lever handle with indicator and graduated dial. *Jobs* can be perfectly balanced when this valve is used, since the maximum port opening required for the individual radiator can be set *after installation* by loosening a lock nut on the dial and moving the indicator stop to the desired position. This limits the turn of the handle which prevents the valve disc from being raised further from the seat. Accurate and fine graduations of steam flow are made possible by a cone-shaped nut projecting into the inlet. Can be equipped with round handle on special order without extra charge. Not furnished with lock and shield.

This valve can be supplied with customer's name on indicator plate in quantities of 500.

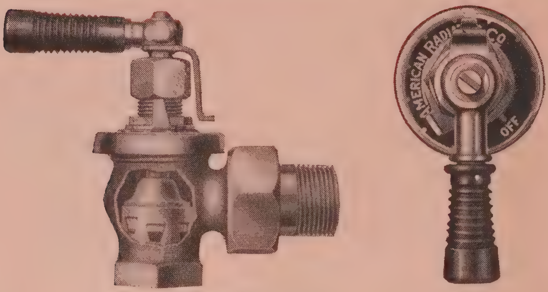
See page 173 for roughing-in dimensions. See page 214 for specification form.

With union, Jenkins disc, rough body, plated all over. Threaded right hand both openings.

List Prices

Size	½ in.	¾ in.	1 in.	1¼ in.
No. 868 Angle	$5.50	$5.50	$6.75	$7.75

DETROIT MULTIPORT VALVE



Stock No. 168
Patented May 6, 1924
For Vapor Heating

A fractional valve with asbestos packing. The best low priced valve for vapor work. Lever handle with indicator and dial. Jobs can be perfectly balanced when this valve is used, since the maximum port opening required for any individual radiator can be set *after installation* by loosening a lock nut on the dial and moving the indicator stop to the desired position. This limits the turn of the handle, which prevents the valve disc from being raised further from the seat. Accurate graduations of steam flow provided by shape and location of openings in shell surrounding the disc holder. Closes tight against leakage into radiator. Can be equipped with round handle on special order without extra charge.

Lock and shield type can be furnished.

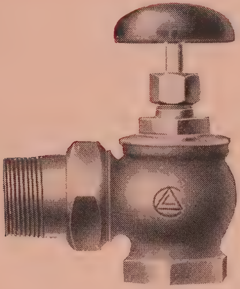
This valve can be supplied with customer's name on indicator plate in quantities of 500.

See page 173 for roughing-in dimensions. See page 214 for specification form.

With union, Jenkins disc, rough body plated all over. Threaded right hand both openings.

List Prices

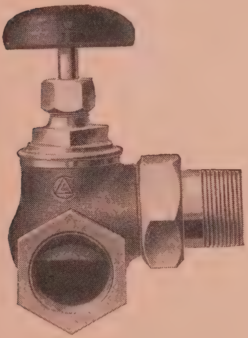
Size	½ in.	¾ in.	1 in.	1¼ in.
No. 168 Angle	$3.70	$4.30	$5.10	$6.40



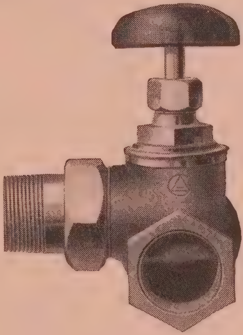
Angle Nos. 72 and 62 with Union

These steam valves—both angle and corner—are machined carefully and subjected to rigid inspection. The metal is well distributed; threads carefully cut.

Equipped with non-breaking composition handle.



No. 32—Right-Hand Valve

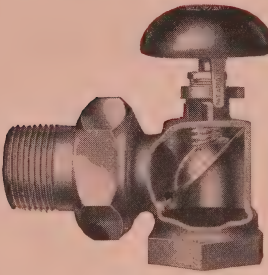


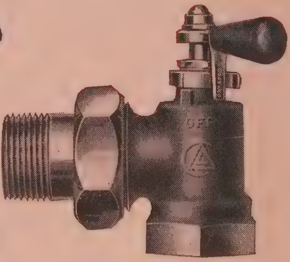
No. 37—Left-Hand Valve

Rough body and polished trimmings plated all over. Threaded right hand. All valves can be furnished with lock and shield. See page 173 for roughing-in dimensions.

List Prices

Stock No.	Size, Inches	½	¾	1	1¼	1½	2
62	Brass Disc Angle	$4.30	$4.90	$5.85	$7.15	$9.40	$14.85
72	Comp. Disc Angle	3.70	4.30	5.10	6.40	8.40	13.60
32 37	Comp. Disc. R. H. Cor. Comp. Disc. L. H. Cor.	4.10	4.75	5.60	7.05	9.25	15.00





Patented June 26, 1923

No. 104 No. 105

DETROIT Equalizing Hot Water Valves allow the contractor to insure uniform flow through every radiator—to balance the job so that each radiator obtains the same circulation. A stop collar is mounted at the neck of the valve, which by merely loosening a set screw, can be moved so that the adjustable stop will limit the movement of the handle before the full "on" position is reached. Thus the area of the opening through the valve may be reduced *after installation* by setting the stop collar at the desired point. It provides accurate balancing of flow and saves the expense of inserting washers or retarders in the connection.

These valves have the famous swinging plate which prevents "sticking" so common with the shell type. The plate (shown in the cut) has contact only on its narrow edge so that corrosion is easily broken away. The edge of the plate also acts as a scraper to keep the interior of the body clean. In the open position the concave plate, set at a 45° angle, reduces friction (like an elbow) and tends to insure full circulation. Indicator shows clearly the "on" or "off" positions. Composition, non-breaking handles.

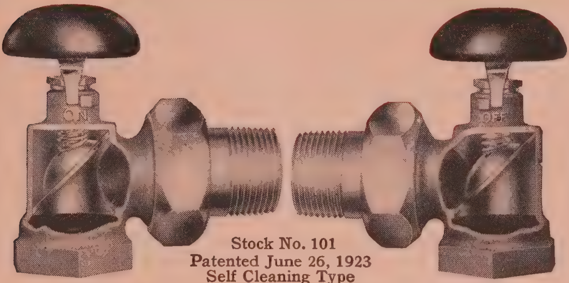
See page 173 for roughing-in dimensions. Page 214 for specification form. Can be furnished with lock and shield.

With union, Angle pattern, rough body, plated all over. Threaded right hand both openings.

List Prices

Size	½ in.	¾ in.	1 in.	1¼ in.	1½ in.
No. 104 Round Handle No. 105 Lever Handle	$3.25	$3.70	$4.50	$5.75	$7.30

Q. O. WATER RADIATOR VALVES



Stock No. 101
Patented June 26, 1923
Self Cleaning Type

Valve Open — Valve Closed

The interior construction of this valve is the same as that of the "Equalizing" Valve (page 170). The swinging plate keeps the inside of the valve clean and prevents "sticking". The concave plate in the open position reduces friction of water flow, providing the effect of an elbow. Indicator shows clearly the "on" and "off" positions. Equipped with composition, non-breaking handles.

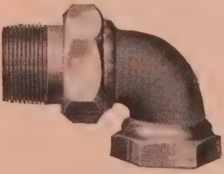
It can be furnished with lock and shield. Roughing in dimensions, page 173.

With Union, Angle Pattern, rough body plated all over. Threaded right hand both openings.

List Prices

Size	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
No. 101	$3.25	$3.70	$4.50	$5.75	$7.30	$12.00

Union Elbows for Water Radiators

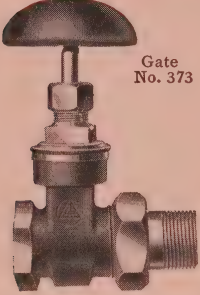


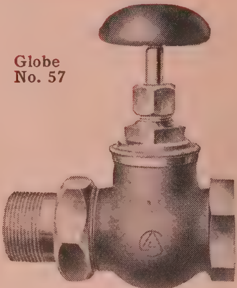
No. 132
Both Threads Right-Hand

Rough body plated. See page 173 for roughing-in dimensions.

List Prices

Size, Inches	½	¾	1	1¼	1½	2
No. 132	$1.75	$2.00	$2.50	$3.30	$4.25	$7.20


Gate
No. 373


Globe
No. 57

No. 373 has double gate with non-rising stem. No. 57 has composition disc.

Both valves equipped with composition, non-breaking handles. Roughing-in dimensions, page 173. Can be furnished with lock and shield. With union, rough body plated. Threaded right hand all openings.

List Prices

Size	½ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.
No. 373 Gate	$3.65	$4.25	$5.20	$6.60	$9.00	$12.80
No. 57 Globe	3.70	4.30	5.10	6.40	8.40	13.60
Extra for Lock and Shield No. 373. Add to List on Valves						
For L & S	.65	.70	.85	1.00	1.20	1.70

IDEAL Draw Off Cock

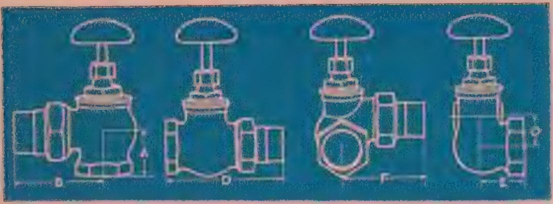

Stock No. 170

Especially designed for a boiler drain valve. Is equipped with a stuffing box which prevents leak on the floor when boiler is being drained. Made of brass throughout—brass seat. Boiler connection ¾″ Iron Pipe size. Outlet, ¾″ Standard hose thread. Brass finish.

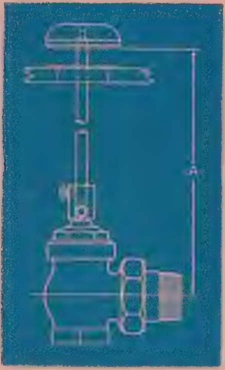
List Price. $1.75

MEASUREMENTS OF VALVES AND ELBOWS

For Roughing-in Work



Size, Inches		½	¾	1	1¼	1½	2
Nos. 62–72–101–104–105 Angle Valves	A	1	1¼	1⅜	1⅝	1 13/16	2 3/16
	B	2⅜	2⅝	3 1/16	3⅜	3 11/16	4 5/16
No. 132 Elbows..........	A	1⅜	1⅜	1 11/16	1 15/16	2 5/16	2⅝
	B	2 7/16	2⅝	3	3 7/16	4	4 7/16
No. 57 Globe Valves.....	D	3⅜	3 15/16	4 11/16	5 5/16	5 15/16	7⅛
No. 168 Multiport Valves.	A	1	1¼	1⅜	1⅝	....	....
	B	2⅜	2⅝	3 1/16	3⅜	....	....
No. 373 Gate Valves.....	D	3 5/16	3 9/16	4	4 9/16	5⅛	5 13/16
Nos. 32 and 37 Corner Valves................	E	1 5/16	1 7/16	1 11/16	1⅞	2 3/16	2 9/16
	F	2 9/16	2 25/32	3 3/32	3¾	3 15/16	4 9/16
	G	21/32	25/32	25/32	15/16	1⅛	1⅝
No. 850–868–878–888 Angle Packless Valves..	A	1¼	1¼	1⅜	1⅝	1 13/16	2 3/16
	B	2⅝	2⅝	3 1/16	3⅜	3 11/16	4 5/16
Nos. 851–852–879–880 Corner Packless Valves.	E	1 7/16	1 7/16	1 11/16	1⅞	2 3/16	2 9/16
	F	2 27/32	2 27/32	3 7/32	3 9/16	3 27/32	4 19/32
	G	25/32	25/32	25/32	15/16	1⅛	1⅝
No. 860–870 Globe Valves	D	3 15/16	3 15/16	4¾	5 5/16	5 23/32	6 27/32



Extension stems can be provided for all patterns of radiator valves. Furnished in four lengths which can be cut on the job to exact length needed. Cannot be supplied where distance "A" is less than 8″. Exterior plate included for Water Valves, Fractional Valves, and Super-Packless Valves indicating on and off positions.

In ordering specify distance "A" so that stems sufficiently long may be supplied. Also state size and style of valve for which extension stems are desired.

List Prices, Each

	1 ft.	2 ft.	3 ft.	4 ft.
For Packed and Packless Valves................	$1.20	$1.50	$1.80	$2.00
For Fractional Valves Nos. 868, 168.........	1.80	2.00	2.20	2.40

Lock and Shield Radiator Valves

All styles of Radiator Valves except Super-Packless Valves and Fractional Packless Valves can be furnished, on special order only, with Lock and Shield. Keys not furnished unless ordered extra. See special list for No. 373 Gate Valves above:

Keys for DETROIT valves, extra, each net. $0.30
Keys for IDEAL Packless Valves, extra each, net.......30

NOTE—When ordering specify number and size of Valve, adding the words "Lock and Shield."

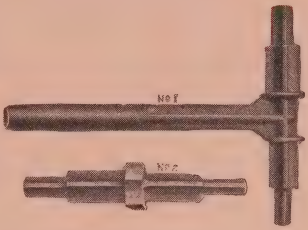
All DETROIT Valves except Gate Valves—One key for ½-inch, ¾-inch, and 1-inch, another for 1¼-inch, 1½-inch, and 2-inch.

Gate Valves—One key for ½-inch and ¾-inch; one for 1-inch to 2-inch.

IDEAL Packless Valves.—One Key for ½ in., ¾ in., 1 in. and 1¼ in. another for 1½ in. and 2 in.

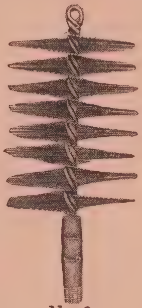
IDEAL Spud Wrenches

For connecting tail pipes of union radiator Valves. Made of malleable iron. Either style embraces 1½, 1¼, 1, and ¾ inch sizes. List Prices each Style 1, No. 590, $0.75. Style 2, No. 591, $0.50.

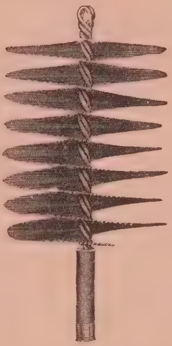


IDEAL Boiler Flue Brushes

No. 1
3¼″ x 1⅜″ x 4″
For Arco Boilers



No. 2
3¾″ x 2″ x 5″
For Sectional Boilers up to 28″; 23″, 29″, 36″ Water Tube and Smokeless Boilers. 32″ Type "A" Boiler, Assembled Sectional Boiler, ARCO Sectional Boiler, ARCOLA-Parlor



No. 3
4½″ x 2¾″ x 6″
For 48″ Water Tube and Smokeless Type "A" Boilers

No. 5
3¼″ x 1¾″ x 4″
For 1 Series and 22″ Type "A" Boilers

No. 6
6¾″ x 2¾″ x 5¾″
For 79″ Water Tube and Smokeless Boilers

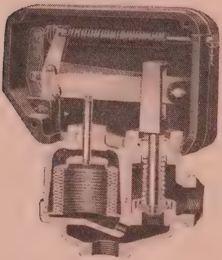
When ordering Flue Brushes, in all cases show on order size and style of Boiler for which they are intended

List Prices: No 1. $0.60; No. 2 $0.80; No. 3. $1.00; No. 5. $0.60; No. 6. $2.00.

ARCO Compound Relief Valves

For Relieving Water Pressure

Stock No. 984
Patent Pending

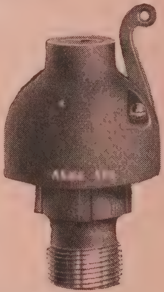


A positive relief valve for hot water heating boilers and hot water supply systems. This new design develops a reserve power, compounded by bellows and levers, sufficient to break any corrosion which may form at the valve seat. Due to the "snap action" of the levers, this reserve power operates with a "blow". Valve automatically re-sets as pressure decreases. Malleable iron body, steel levers. The Valve proper has brass trimmings with bronze spring. Relieving pressures regularly furnished:—Primary 30 lbs., Emergency 40 lbs., for heating boiler. Primary 75 lbs., Emergency 100 lbs., for hot water supply. Other relieving pressures furnished on special order. Height, 10½ inches; width, 9¼ inches; Weight boxed 16 lbs.

No. 984, Size 1″, List price $20.00.

IDEAL Pop Safety Valves

Low Pressure, Baked Enamel Finish. Stock No. 971.



These valves are especially designed for house heating boilers. Regularly set to relieve at 15 lbs. Non-adjustable. Comply with A. S. M. E. standards.

On special order at extra charge they can be set to relieve at any pressure from 5 lbs. to 25 lbs. Factory shipment only.

Can also be furnished on special order at extra charge with nickel plated finish

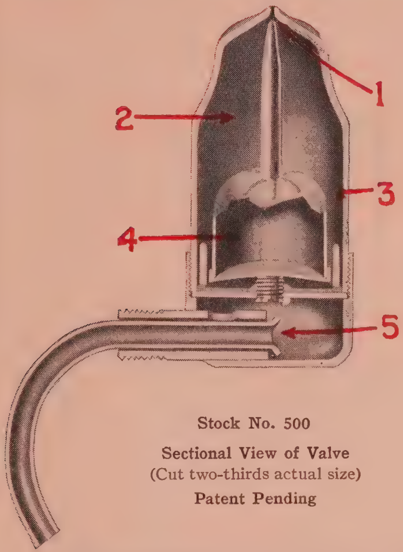
Vapor Pop Safety Valves

For Vapor Heating. Stock No. 961

Can be set to relieve at 1½ lbs. or 3 lbs. Order should specify desired relieving pressure.

List Prices

Size, inches	1	1¼	1½	2	2½	3	3½	4
Stock Nos. 971 and 961, each	$6.00	$6.75	$8.25	$11.25	$26.00	$37.50	$50.00	$80.00



Stock No. 500

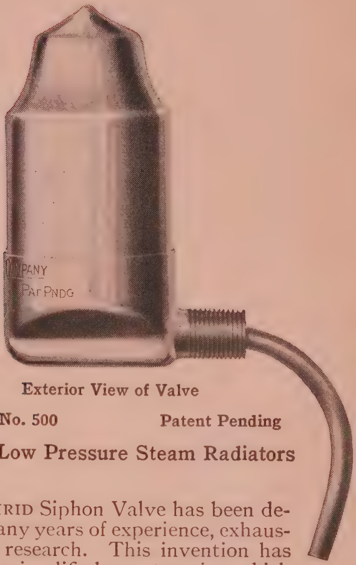
Sectional View of Valve
(Cut two-thirds actual size)
Patent Pending

For Venting Low Pressure Steam Radiators

Distinctive Features

1. No seat "plug" or guide. Reduces to a minimum the liability of clogging from dirt and insures dry operation by preventing capillary attraction from holding water in suspension around the opening.
2. Large separating chamber. Ample space for air and water to separate, insuring that only air will pass out the opening.
3. Proper area between float and shell allows water to drain from the valve when siphon operates. This feature simplifies construction as it makes unnecessary a by-pass from nipple to top of shell.
4. Float contains volatile liquid sealed under vacuum. Steam temperature causes internal gas pressure, expanding diaphragm at bottom of float closing valve. Vacuum insures valve will always open when cool.
5. Siphon tube free to rotate during installation. Will slip inward on radiators with thin sections (as CORTO) preventing damage to tube.

See next page for data, price, etc.



Exterior View of Valve

Stock No. 500 **Patent Pending**

For Venting Low Pressure Steam Radiators

The Ideal Airid Siphon Valve has been developed after many years of experience, exhaustive study and research. This invention has made possible a simplified construction which provides a perfect air valve at a reduced cost.

The Ideal Airid Siphon Valve will vent the largest radiator quickly without steam- or water-leak, insuring every loop steam hot. On flooded radiators they close tight against water leak yet the quick acting siphon instantly frees the valve of water so that it will open and continue to relieve the air. It is non-adjustable and made entirely of metal. Tenants cannot tamper with it. It is of pleasing design, highly nickeled and polished. Made complete in our own factories under our own inspection and test. Guaranteed for five years.

Regularly packed in attractive Display Boxes—12 to a box. Weight of box of twelve, 4 lbs.

Stock No. 500 Angle connection—1/8 inch, each $1.60.

Stock No. 502 Straight shank—1/8 inch each $2.25.

Stock No. 501 Government Holder attachment for Airid Valves, each $0.50.

See page 214 for correct specification form.

IDEAL AIRID VALVE DISPLAY BOXES

It is estimated that *one-half* the automatic air valves sold are for replacements on jobs already installed, where old valves of inferior design have worn out and are causing annoyance and waste of coal from air-bound radiators. The millions of old air valves now installed should be replaced with the improved modern AIRID. This offers a profitable field to the dealer in heating material for sales "over the counter". A few AIRIDS sold to owners of steam plants will bring orders for more and develop new customers for other lines.

An extensive advertising campaign is being carried on each year to create demand for AIRIDS. Dealers can take advantage of this advertising by "tying up" their stores and show windows to the national campaign. Building owners will go to shops where AIRIDS are in stock and are prominently displayed. An attractive window display of AIRIDS will attract these buyers and increase sales.

To aid dealers in these sales AIRIDS are packed in attractive boxes—printed in four colors—ready for display, without extra charge. Twelve valves in each box. Shipping weight per dozen valves, 4 lbs

IDEAL Air Line Valve

Stock No. 816
Patent Pending

For venting steam radiators where drip line, air line or vacuum air line is used.

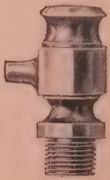
The IDEAL Air Line Valve operates on the same general principle as the IDEAL AIRID Valve. It is always open to the passage of air but closes tight when steam reaches it. Should water reach the valve, it remains open for passage of the water to the drip line. It insures a hot radiator but keeps the air line cold. Non-adjustable, cannot be "tampered" with, made entirely of metal, sensitive in operation.

When steam reaches the valve it vaporizes a volatile liquid contained within the thermostatic member, creating a gas pressure and expanding outward the diaphragms which form the top and bottom of the member. This forces the pin to the seat, closing the valve. When the valve cools the vapor condenses, relieving the pressure and opening the valve. It is either wide open or closed tight. Made in our own factories under our own inspection and test.

Nickel-plated—1/8" radiator connection; 1/4" female union on outlet. Packed 6 in a box. Weight of six packed, 2 lbs. List $3.50.

See page 214 for Correct Specification form.

Compression Air Valves



List Prices

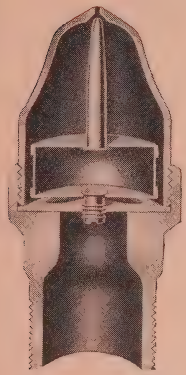
Per Doz.

Stock No. 520—Wood Wheel, nickel-plated, wt. pkd. 1 1/3 lbs. doz.$4.00
Stock No. 521—Key, nickel-plated, wt. pkd. 1 1/4 lbs. doz........3.00

Two keys regularly furnished with each dozen.

Extra Keys, 5 cents each, net.

IDEAL Quick Vent



No. 815 Quick Vent

For venting mains, long runs of pipe, indirect stacks, drop risers, etc., where air must be expelled quickly. Will benefit all low pressure steam jobs by venting piping system and thereby heating radiators quicker under less pressure. Operates by volatile liquid contained within expansible member which has diaphragm at top and bottom, giving ample movement of stem. No adjustment. All metal. Will last indefinitely. Does not close against water. Venting port $\frac{3}{32}$ inch diameter. Valve connection regularly ¾-inch pipe thread. Can be furnished with ⅜ inch thread. Nickeled finish. Weight of 6 packed, 2 pounds.

Made in our own factories under our own inspection and test.

List Price, each No. 815–¾″, No. 820–⅜″ $3.00

See page 214 for correct specification form.

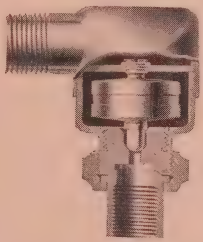
IDEAL Vento Vent

Patent Pending

Stock No. 817

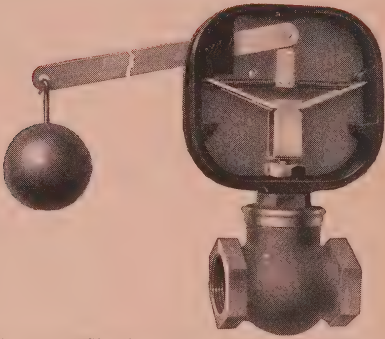
For Use on Vento Heaters and Blast Coils

This valve is designed particularly for relieving air from Vento heaters (low pressure only). It has a large venting port—$\frac{3}{16}$ inch diameter. Operates by volatile liquid contained within expansible member with diaphragm at top and bottom. No adjustment. All metal. Does not close against water. Connection to heater ⅜ inch pipe size. Outlet fitted with ¼ inch female union for air line. Can be set in any position. Nickel plated. Weight of 6, packed, 2 lbs. Specification form page 215. List Price each...$4.00



No. 817 Vento Vent

ARCO SNAP-ACTING GAS VALVE



Stock No. 791 (Showing Housing Removed) Patent Pending

A Control Valve for Use with Thermostats and with Pressure and Temperature Regulators—Natural or Manufactured Gas.

The ARCO Snap-Acting Gas Valve prevents backfire. The movement of the stem is instantaneous. It is "snapped" open or "snapped" closed at the instant the lever reaches the end of its travel. Requires minimum of power to operate it.

An entirely new principle of spring and toggle construction is employed which maintains full spring pressure on the seat—keeping the valve closed tight—till the instant it "snaps" open. This prevents leakage of gas to the burner before the opening movement takes place, which frequently causes back-firing in the mixer.

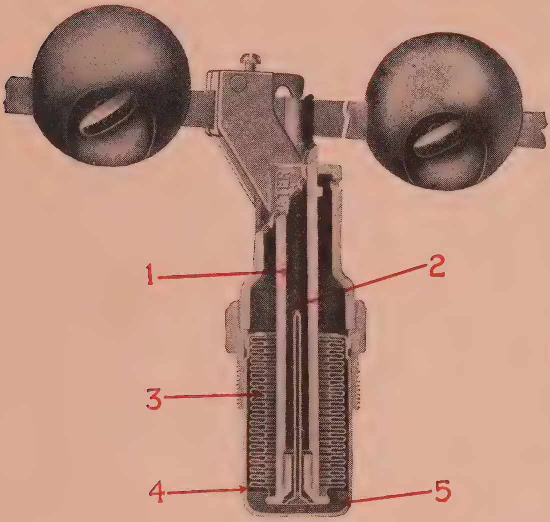
The ARCO Snap-Acting Gas Valve can be used with the No. 805 ARCO Steam Regulator, No. 800 ARCO Water Regulator, Honeywell Temperature Regulator, or similar house thermostats. Note: It should *not* be used with the No. 801 ARCO Junior Water Regulator. On Hot Water Supply Boilers use No. 800 Water Regulator with this valve.

Made in our own factories under our own inspection and test.

Ball weight furnished with each valve. Frame can be loosened and swung at an angle to run of pipe if necessary.

List Prices

Size, inches	3/4	1	1 1/4	1 1/2	2
List	$14.00	$16.00	$18.00	$20.00	$24.00
Weight, boxed	4 1/2 lbs	5 lbs.	7 lbs.	8 lbs.	9 1/2 lbs.
Height from center of run	6 1/16 in.	6 5/16 in.	7 5/16 in.	7 in.	8 1/2 in.
Valve length end to end	4 5/8 in.	5 3/8 in.	5 15/16 in.	6 5/8 in.	7 13/16 in.

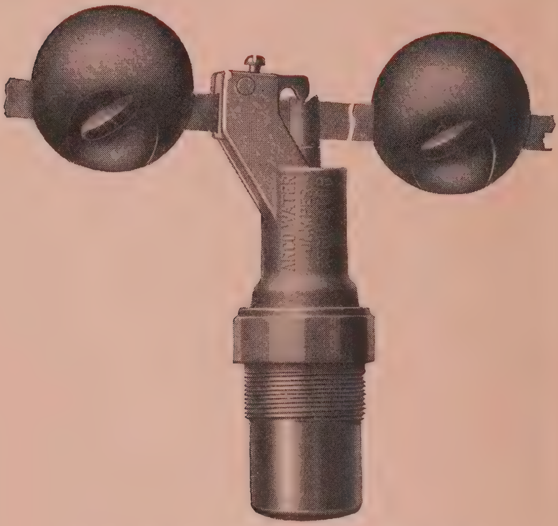


No. 800
Patented Sept. 23, 1924; Patent Pending
For Damper Control on Hot Water Boilers

Damper Control on Hot Water Boilers is as necessary as on Steam Boilers. It saves fuel by preventing over-heating, saves the inconvenience of attending to drafts, and gives the comfort of a steady water temperature.

Distinctive Features

1. Stem transfers work from bottom of bellows, distributing travel equally to each fold.
2. Filling tube provides positive method of sealing liquid chamber. No chance of losing power through leak at filling point.
3. One-piece bellows made in our own factory. Lower head an integral part of bellows—not soldered.
4. Design provides extra long temperature range—100 degrees to 220 degrees standard.
5. Volatile liquid develops pressure on *outside* of bellows insuring long life, accuracy, and sensitiveness.



Stock No. 800 Patented Sept. 23, 1924. Patent Pending

For Damper Control on Hot Water Boilers

A damper Regulator designed for Hot Water Boilers which will control the drafts so as to maintain a constant water temperature at any degree between 100° and 220° Fahr.

The ARCO Water Regulator is made entirely of metal. Within the bulb is an expansible metallic bellows, surrounding which is volatile liquid. As the water temperature in the system increases, the liquid vaporizes and the gas pressure generated thereby compresses the bellows and forces upward the thrust rod or stem which tilts the lever and closes the drafts. As the water cools the gas pressure is relieved and the counterweight opens the drafts. There are no perishable parts to wear out. The action is sensitive and accurate. Adjustment for temperature is obtained by changing the position of weights on the lever.

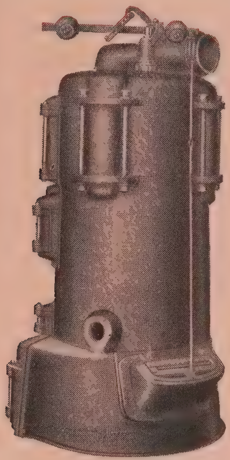
Made in our own factories, under our own inspection and test.

See page 215 for specification form.

Data, Dimensions and Price

Length of Bulb 2⅞ inches. Connection, 2″ standard pipe thread. Trimmings consist of one 37-inch lever, two four-pound weights, 12 feet of chain, two ceiling pulleys, four "S" Hooks. Shipping weight 15 lbs.

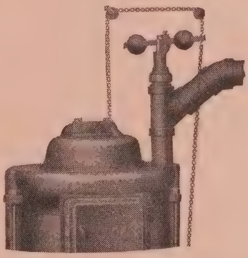
Stock No. 800 List Price $18.00



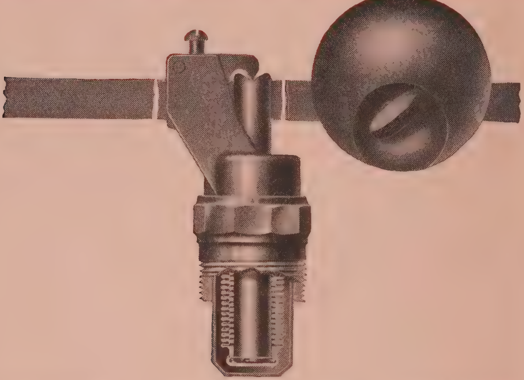
Method of installing No. 800 ARCO Regulator on Ideal ARCO Boilers with ARCO Damper Control

On Ideal Arco Boilers equipped with the Arco Damper Control, the Regulator is installed as shown by inserting in a 2-inch opening provided in the dome section of the boiler. It is connected to the damper by means of the lever and arms supplied with the Hand Control. Temperature adjustment is made by moving the weights on the lever bar. Two weights are supplied. If proper temperature is not obtained by using one weight, both may be used.

On other type boilers not equipped with Water Regulator a standard Y fitting (3 inches or larger) should be installed in one of the flow pipes and the Regulator inserted in the top opening by means of bushing (to 2 inch) as shown. Connection should be made to dampers with chain and pulleys. Temperature adjustment is made by moving weights on lever. For high temperatures both weights may be placed on rear of lever. Complete directions sent with each Regulator.



Method of Installing No. 800 Regulator using chains and pulleys



Stock No. 801 **Patented Sept. 23, 1924** **Patent Pending**

This Regulator is designed especially for Hot Water Supply Boilers. As the dampers are small and light, less power is required to operate them. The construction and operation is similar to that of the No. 800 ARCO Water Regulator, described on page 183, but it is smaller and less powerful.

Damper control on Hot Water Supply Boilers is of vital importance, although it is frequently overlooked. Regulation saves fuel by preventing over-heating, saves attention to drafts and maintains constant water temperature. The ARCO Junior Water Regulator prevents boiling, sputtering, steaming water at the faucets and insures plenty of hot water as long as there is sufficient fire in the heater. It also prevents the annoyance and waste caused by the fire burning out and requiring rekindling, which frequently occurs in Hot Water Supply Boilers not equipped with Regulator. In localities where lime is present in the water, the ARCO Junior Regulator prolongs the life of the heater by reducing to a minimum the lime deposit in the heater, since it prevents unnecessarily high water temperature at which most of the precipitation takes place.

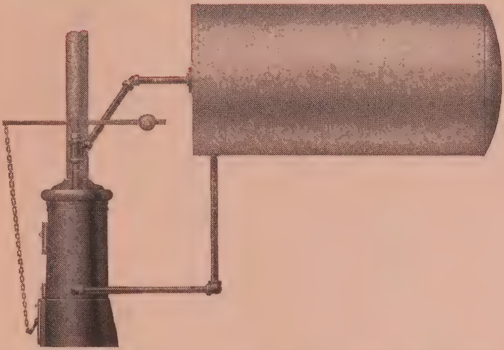
Made in our own factories and under our own inspection and test.

See page 215 for specification form.

Data, Dimensions and Price

Length of bulb, 2 inches. Connection, 1½-inch standard pipe thread. Temperature Range 130° to 180° Fahr. Trimmings furnished, one 30-inch lever, one 3-lb. weight, 6 feet of chain, two "S" Hooks. Shipping weight, 11 lbs.

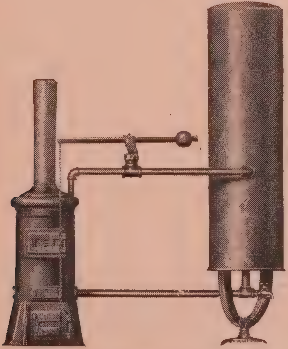
Stock No. 801. List Price $16.00



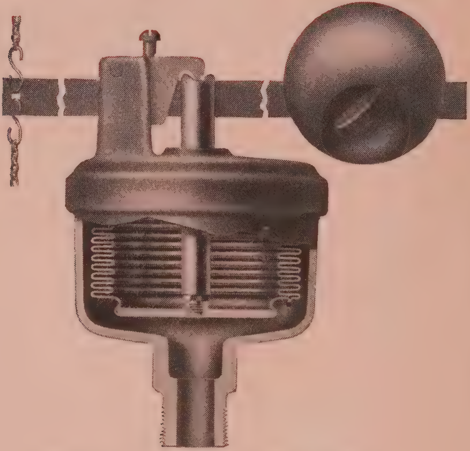
Method of installation on Hot Water Supply Boilers using Y fitting

On Hot Water Supply Boilers the Regulator is inserted in a 1½″ Y fitting or Tee as shown, and connection made by chain to ash pit draft. Temperature adjustment is made by moving weight on lever.

Complete instructions furnished with each Regulator.



Methods of installation on Hot Water Supply Boilers using Tee fitting



Stock No. 805 **Patent Pending**

An all-metal pressure Regulator for controlling dampers on Steam Heating Boilers. It is sensitive and accurate. The diaphragm is a metallic bellows of our own design and manufacture. The Regulator contains no quickly-deteriorating rubber thus saving the annoyance and expense of renewals so common with regulators using a rubber diaphragm.

The design of this regulator is such that the steam pressure is on the **outside** of the bellows, with the stem or thrust rod extending down within the bellows where it is attached to the bottom-head. These two fundamental features insure that the bellows expands or contracts evenly in all folds. There is no tendency for the bellows to tilt, and thus unduly stretch the metal on one side. This means long life and great sensitiveness. The head is formed as an integral part of the bellows, thereby eliminating possibilities of leak at a soldered joint.

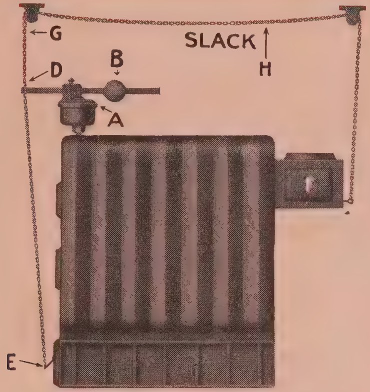
For pressures up to 15 lbs.

Made in our own factories, under our own inspection and test.

Data, Dimensions and Price

Connection is standard 1-inch male thread. Trimmings furnished, one 36-in. lever, one 4-lb. weight, 12 feet of chain, 2 ceiling pulleys, 4 "S" Hooks. Shipping wt., 16 lbs.

Stock No. 805. List Price $16.00



With Boiler using chains

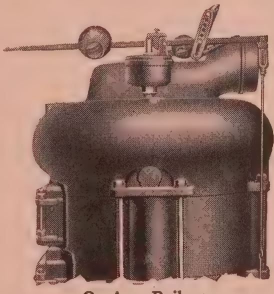
Adjusting ARCO Steam Regulator

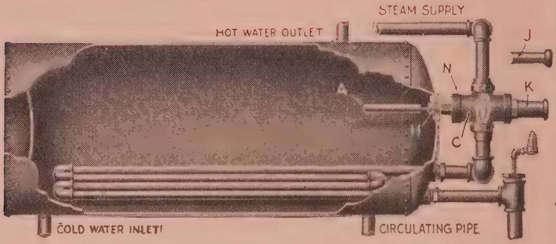
With no pressure on boiler and weight "B" in position on lever, connect chain between "D" and "E" so that draft "E" will be open as wide as desired for greatest draft. Connect "G" over pulleys to "F", leaving just enough slack so that chain "G" is taut when both drafts are closed. Set weight "B" so that lever "D" tilts when steam is raised to the pressure desired to be maintained.

When pressure increases, draft "E" will close and check combustion. If fire is clean and pressure should continue to increase, lever "D" will continue to move downward, opening check draft "F" to completely check fire. As pressure decreases "F" *will gradually close.* If pressure falls below the desired amount "E" will open.

For best results, connections should be made so that draft "E" opens but slightly and drafts "F" opens wide.

On Arco Boilers, draft should be connected by means of rods and "goose neck" lever as shown. Adjust connections as explained above, so that one draft closes before the other opens.


On Arco Boilers



Arco Tank Regulator. Direct connected type
Stock No. 825 Patent Pending

For automatic regulation of the temperature of water or other liquids heated by steam.

For steam pressure up to 15 lbs

For use in hotels, schools, office buildings, hospitals, apartment buildings, factories, public institutions.

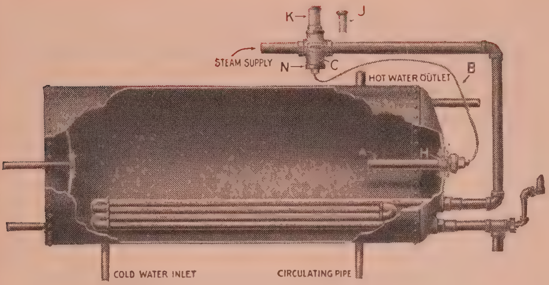
Employs a single seated valve, which eliminates the leak through the valve so common with double seated valves. Regulator can be placed in any position. It is sensitive, accurate and positive in operation. The valve has no stuffing box and cannot leak steam around the stem. It will not bind in operation, hence insures close regulation.

No moving parts are exposed, but are encased in a cast iron housing finished in baked enamel. Interior parts are of brass with renewable seat and disc of phosphor bronze. The bellows used in this construction is made from our own design, of one piece of brass—not from built-up discs. The regulator and bellows are made complete in our own factories under our own inspection and test.

Particular attention is directed to the novel method of grouping the sizes. Improvements in design have made possible the use of one regulator for several sizes. For example, Size A regulator is used for ½″, ¾″ and 1″ pipe connections. It is threaded 1″ and sets of bushings are furnished with each regulator for ¾″ and ½″, so that this one regulator can be used for any of the three sizes of pipe.

For List Prices, see next page.

ARCO TANK REGULATOR



Arco Tank Regulator. Flexible Tube Type
Stock No. 826 Patent Pending

Both the flexible tube type and the direct connected type operate on the same principle. The operating power is the expansion of gas. Gas is readily responsive to temperature changes, hence quick operation and close regulation. An increase in temperature of the water surrounding the bulb "A" increases the internal gas pressure in the bellows chamber (enclosed at "C") which forces up the head of the bellows and the valve stem, closing the valve. A slight cooling of the water causes a lessening of the gas pressure which allows the compression spring (enclosed at "K") to open the valve. Adjustment for temperature is made at "K" by means of a key "J". This feature prevents "meddlers" from tampering with the adjustment.

Temperature range regularly furnished 140°–180° Fahr. Special temperature range supplied on special order. Both types for use on steam pressure up to 15 lbs. only.

All sizes have iron body—brass interiors with bronze disc and seat. Sizes A and B have unions both ends. Sizes C and D have screwed ends. Flexible tube on No. 826 is regularly furnished 8 ft. long. Regulators with longer tubes can be supplied on special order.

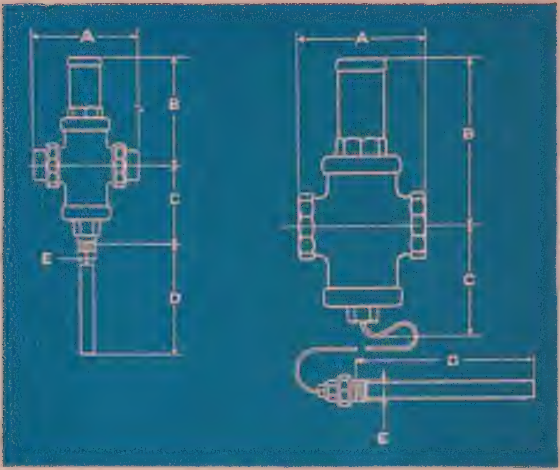
See next page for roughing-in dimensions and size and length of bulb.

Page 215 for specification form.

List Prices

Furnished complete with adjusting key and bushings. Full directions for installation with each regulator.

Stock No.	Size	For Pipe Connections	Type	Shipping Weights lbs.	List Price
825	A	½″–¾″–1″	Direct connected with unions.....	20	$50.00
825	B	1¼″–1½″	Direct connected with unions.....	25	60.00
826	A	½″–¾″–1″	Flexible Tube with unions.....	20	60.00
826	B	1¼″–1½″	Flexible Tube with unions.....	25	70.00
826	C	2″	Flexible Tube screwed ends....	50	80.00
826	D	2½″–3″	Flexible Tube screwed ends....	60	90.00

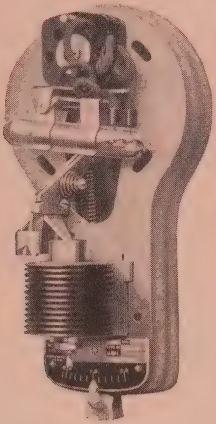


No. 825 No. 826

Measurements

For Roughing-in work

Dimension in inches...........	A	B	C	D	E
No. 825 Direct Connected					
Size A for ½″, ¾″, 1″ pipe..	7½	5 7/16	4⅞	6 9/16	1
Size B for 1¼″ and 1½″ pipe	8 3/16	8 3/16	6 1/16	8 9/16	1
No. 826 Flexible Tube					
Size A for ½″, ¾″, 1″ pipe...	7½	5 7/16	5	5⅞	1
Size B for 1¼″ and 1½″ pipe	8 3/16	8 3/16	6 3/16	7⅞	1
Size C for 2″ pipe............	8¾	8¼	6 3/16	9⅛	1¼
Size D for 2½″ and 3″ pipe..	9¾	12 11/16	8 5/16	15⅛	1¼



Mercoid Thermostat with Cover Removed
Stock No. 845 Patent Pending

The Mercoid Thermostat is for use where it is desired to make or break an electric circuit according to temperature changes. The current is thrown on or off *direct* to the motor or other units. No relay or other "remote control" is necessary. Has many applications such as oil burning apparatus, refrigeration work, control of motors, pumps, fans, etc.

The Mercoid Thermostat operates by the expansion of a volatile gas contained within a flexible metal bellows. When the temperature increases, the bellows expands, tilting the Mercoid—a sealed glass tube containing inert gas and mercury. When the tube is tilted mercury flows to one end making contact *within the tube.* Tilting movement positive and quick acting. Gives accurate regulation. No open arc. No corrosion or oxidation of contacts. A positive safe-guard against fire or explosion. Tests show the tube perfect after hundreds of thousands of operations.

Rating: 10 amperes at 110 volts or 5 amperes at 220 volts, either direct or alternating current. Will handle current for motors up to one horse power. Adjustable by indicator for temperature. Can be furnished with various temperature ranges within limits of minus 20° to plus 250° Fahrenheit.

Write for prices and complete data on No. 845—also No. 848 Industrial type. Give full details of use.

8-Day Clock Automatic Thermostat

This Regulator with its various combinations of thermostat and motor represents the latest development of automatic draft control. The heating contractor will find many distinctive features which make the Honeywell Temperature Regulator attractive and useful to the house owner, and easy to install.

Models of Honeywell Temperature Regulators

There are three models of thermostats and three models of motors:

Plain Thermostat
One Day Clock Thermostat
Eight Day Chronom Clock Automatic Thermostat
Gravity Motor
Spring Motor
Electric Non-Wind Motor

Thermostats differ only in the clock construction. The same accurate thermostatic blade is used in all. The same high grade material and workmanship are found in each type of motor. An attractive display board complete with regulator connected to draft and check dampers for practical demonstration can be furnished. A great aid in making sales. Price on application.

Eight-Day Automatic Thermostat

This is the popular model. It performs its functions quite independently of any attention or adjustment. The clock feature automatically lowers the temperature at night at any time desired and automatically raises it to 70 degrees in the morning at any hour desired. During the day the Thermostat maintains accurately any temperature between 55 degrees and 85 degrees and it can be used independently of clock by simply pulling out the button. Winding the clock once a week is all the attention required. Clock is wound from the front—an exclusive feature of much importance. Thermostat regularly furnished in statuary bronze finish. For list prices see page 197.

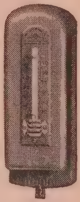
One-day Clock Thermostat

One-Day Clock Thermostat

This model is equipped with a one-day clock which automatically sets the temperature indicator up in the morning at any predetermined time. With this thermostat it is necessary to wind the clock once every 24 hours and set the indicator back each evening before retiring. It can be operated independently of the clock if desired. Temperature range 55° to 85°. Dark antique finish.

Plain Model Thermostat

This model is like the others except that it has no clock. It is used for various purposes where clock control is unnecessary, maintaining the temperature at whatever degree the indicator is set. The temperature range is from 55° to 85°. Dark antique finish.

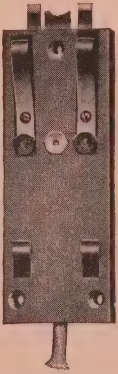


Plain Thermostat

Special Features

All Honeywell Thermostats are equipped with a wall plate which is interchangeable with all models. This greatly simplifies attachment of thermostat to wall and wire connections. All thermostats have a patented adjusting feature by means of which correct adjustment can be made when necessary, without altering the distance between the contact points. The thermostatic blade is extra long and extremely accurate. All thermostats are carefully tested and correctly adjusted before shipment.

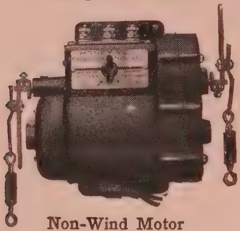
For list prices see page 197.



Interchangeable Wall Plate furnished with all models

Motors

The power to operate the dampers of the heater is supplied by motors which are strong and well made. They have ample power to lift the heaviest dampers or to operate steam or gas valves. Moisture—dust—and rust proof—all bronze bearings and gears. All types provided with basement switch for operating dampers when shaking or coaling the heater. Noiseless in operation. Spring and gravity motors require two dry cells or transformer connected to city lighting current—A. C. only. Moisture proof carton furnished with each. Automatic cut-out prevents motor from running down with front draft open.



Non-Wind Motor

Non-Wind Motor

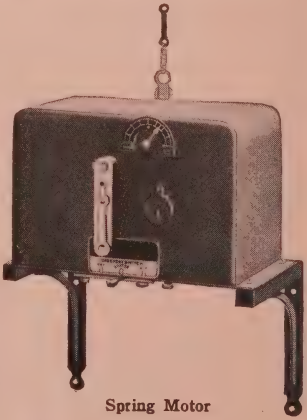
The non-wind type motor contains a small electric motor which furnishes the power for operating the dampers. It requires no winding or other attention. It uses electricity from the city lighting system. No transformer. Completely housed with enameled iron cover. Basement switch and terminals easy of access. Simple in design but reliable and powerful. Detachable bracket makes easy installation.

Spring Motor

The spring motor furnishes power from a coil spring. Will give 60 to 75 operations on one winding. Quickly wound at the front by key. Indicator shows when winding is necessary.

Gravity Motor

The gravity motor is similar to the spring motor except that the power is supplied by a 10 lb. weight. This motor requires winding more often than the spring motor.



Spring Motor

List Prices

Stock No.	Style	Model	Shipping Weight	Price
732	18 A.C. Chelsea	8-Day Chelsea Clock—Non-Wind Motor, A. C.	23 lbs.	$100.00
725	18 A.C.	8-Day Chronom Clock—Non-Wind Motor, A. C.	23 lbs.	90.00
724	16 A.C.	One-Day Clock—Non-Wind Motor, A. C.	23 lbs.	77.00
723	14 A.C.	Plain Model—Non-Wind Motor, A. C.	23 lbs.	70.00
731	8 Chelsea	8-Day Chelsea Clock—Spring Motor	21 lbs.	75.00
722	8	8-Day Chronom Clock—Spring Motor	21 lbs.	65.00
721	6	One Day " " "	21 lbs.	52.00
720	4	Plain Model—Spring Motor	21 lbs.	45.00
719	G-8	8-Day Chronom Clock–Gravity Motor	33 lbs.	58.00
718	G-6	One Day " " "	33 lbs.	45.00
717	G-4	Plain Model—Gravity Motor	33 lbs.	38.00
733	18 D.C. Chelsea	8-Day Chelsea Clock—Non-Wind Motor—Direct Current	23 lbs.	100.00
728	18 D.C.	8-Day Chronom Clock—Non-Wind Motor—Direct Current	23 lbs.	90.00
727	16 D.C.	One-Day Clock—Non-Wind. Motor —Direct Current	23 lbs.	77.00
726	14 D.C.	Plain Model—Non-Wind. Motor—Direct Current	23 lbs.	70.00

Orders for A. C. outfits should specify voltage and cycle of current. Extra charge where current is other than 110 volts, 60 cycle.

D. C. non-wind outfits require two dry cells for thermostat circuit only. Motor circuit supplied by city lighting current. Orders should specify voltage. Extra charge where current is other than 110 volts.

Low Voltage Transformer, Stock No. 730 (for use in place of batteries with Spring and Gravity Motors) $5.00

Batteries not furnished. At time of installation contractor will supply dry cells for each Regulator, thus insuring batteries of full strength.

Send for special booklet.

List Prices—Special Balanced Check Dampers

With Saddles—No. 911

6 in. Saddle, 6 in. Rim.....$2.60	9 in. Saddle, 8 in. Rim...$3.30
7 in. Saddle, 6 in. Rim..... 2.80	10 in. Saddle, 10 in. Rim... 3.80
8 in. Saddle, 8 in. Rim..... 3.30	12 in. Saddle, 10 in. Rim... 3.80

Without Saddles—No. 912

6 in..........$2.00   8 in..........$2.50   10 in..........$3.00

Honeywell Aquastat

For use with motors of the Honeywell Temperature Regulator to control water temperature. Temperature range 100° to 200° Fahr; ¾-in. connection.

Stock No. 729, shipping weight 4 lbs. List Price...$20.00

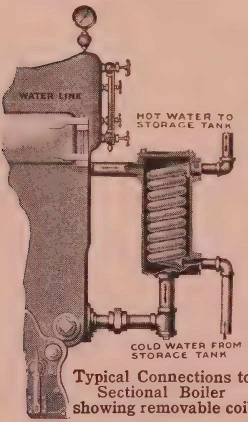
For Heating Domestic Water Supply with Steam and Vapor Boilers

Stock No. 740

The Excelso Heater is connected externally to the boiler below the water line. The hot water from the heating boiler circulates through the heater around a copper coil through which passes the domestic water. The water in the heating boiler is always hot as long as there is fire in the fire pot, hence hot water for domestic use will always be obtained whether the fire is banked or whether there is pressure in the system. This type of heater can never boil the water in the tank nor cause pounding in the pipes or scalding steam at the faucets. It does not affect combustion in the boiler, as the coil is not in contact with the coal. It simply has the effect of adding the equivalent of a small amount of radiation to the boiler.

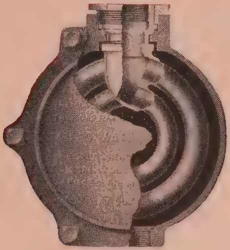
The Excelso Heater saves greatly in fuel as compared with the method of operating second heater, either coal or gas, since during the greater portion of the year the second fire may be eliminated. A small hot water supply boiler is generally used for the summer and is cross-connected to the Excelso Heater, so that when one fire is extinguished the other may be started immediately. This means a saving in fuel and operating care since only one fire is required throughout the whole year.

See next page for capacities, dimensions and price.



Typical Connections to Sectional Boiler showing removable coil

EXCELSO WATER HEATER



Stock No. 740

Showing Double Coil Construction of Nos. 25, 26, 27, and 28.

The Excelso Heater is also variously used in factories and large buildings of all kinds. It is particularly well adapted to take the place of a steam coil in a storage tank where live steam is available. Send for booklet showing many special applications.

Made of cast iron with removable copper coil, attached by ground joint connections. Junior Excelso has expanded coil connections. Water for domestic use comes in contact with copper or brass *only*. Sizes 25, 26, 27, and 28, for heavy duty service have double coil as shown in cut. No packing. See page 215 for specification form.

Where the boiler is not provided with tappings for the heater, the Excelso Rotary Hack Saw will cut openings of the correct size in a few minutes. All Steam Boilers manufactured by us are regularly supplied with tappings for Excelso Heaters.

Dimensions—List Prices—Capacities

Shipped complete—crated—ready for use. Stock No. 740.

Size of Heater	Jr.	11	12	13	14	15	25	26	27	28
Length, inches	8½	10½	14	11½	15	19½	12½	15	19	23¼
Diameter, inches	5	5	5	6½	6½	6½	9	9	9	9
Shell openings, in.	1	1	1	1½	1½	1½	2	2	2	2
Coil openings, in.	¾	¾	¾	1	1	1	1½	1½	1½	1½
Weight crated, lbs.	11	17	23	31	39	46	55	68	82	95
List Price	$12.50	$30	$40	$50	$60	$70	$120	$150	$180	$210

Heating water below Water line of Steam or Vapor Boilers

Size of Heater	Jr.	11	12	13	14	15	25	26	27	28
Tank Capacities, gals.	30	30	45	60	90	120	160	200	300	400

Heating Water with Live Steam

Size of Heater	Jr.	11	12	13	14	15	25	26	27	28
Tank Capacity, gals.	50	50	75	100	150	200	250	300	450	600

Capacity figured at temperature rise 100 degrees in 3 hours. When Excelso Heaters are used, allow extra load on boiler 1½ square feet of radiation for each gallon of water heated per hour.

Excelso Rotary Hack Saw

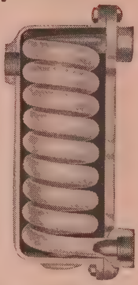
Makes a clean circular cut in iron or other metals. Applicable to all kinds of work when tappings are required. Operated in an ordinary brace, it will cut through ¼″ of iron in a few minutes. **Shipped complete with two sets of blades for each size, 1″, 1½″, 2″.**

Stock No. 739 $7.50 net each.

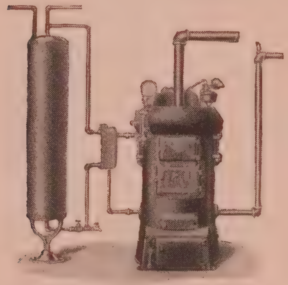
For Heating Domestic Water Supply with Steam or Vapor Boilers

Stock No. 626

The Domestic Taco Water Heater is connected below the water line on Steam or Vapor boilers. The water in the heating boiler circulates through the heater, transferring its heat to the domestic water which flows through the coil to the tank. This provides constant supply of hot water at all times since the water in the boiler is always at a high temperature, even if it is not actually making steam. The domestic water cannot boil and cause pounding in the tank or steaming at the faucet. Domestic Taco Heaters do not interfere with combustion in the boiler.



Sectional View of Domestic Taco, Showing Removable Coil



Typical Installation of Domestic Taco Heater

The Domestic Taco Heater consists of a cast iron housing containing a one-piece coil permanently connected to a removable cover. This coil connection never has to be broken, thus eliminating all chance for the domestic water to leak into the heating boiler. It allows a thorough cleaning of the water chamber and of the coil itself without disconnecting the coil from the tank and without breaking the connections between the coil and the cover.

Data and List Price

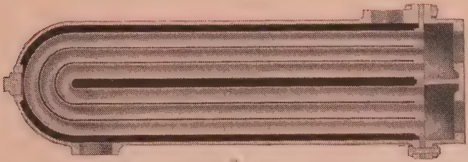
Domestic Taco—Stock No 626

Size	Tank Capacity Gallons	Boiler Connections Inches	Tank Connections Inches	Height Over all Inches	Shipping Weight lbs.	List Price
30	30	1	¾	10½	12	$15.00
1	40–60	1	¾	11¾	15	20.00
2	80	1¼	1	13½	25	30.00
3	160	2	1¼	19 1/16	50	50.00
Flo-Line Taco. Stock No. 627. (For use in flow main.)						
01	60	3	¾	9⅜	25	$25.00
02	120	4	1	13⅞	50	35.00
03	240	5	1¼	19⅝	75	55.00

Where Taco Heaters are used, add for extra load on boiler 1½ square feet of radiation for each gallon of water heated per hour.

See page 215 for specification form.

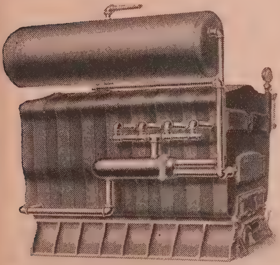
APARTMENT TACO WATER HEATERS



Sectional View of Apartment Taco. Stock No. 628

The Apartment Taco is designed for use on apartment buildings and similar installations where a large quantity of hot water is required. It is usually installed below the water line on steam or vapor boilers as shown in the cut. Consists of a cast iron housing containing U-Tubes of copper expanded into a bronze tube plate. Tubes can be removed for cleaning by detaching the head.

Domestic water cannot overheat and boil with this Heater. During the winter the fire in the water heater is dispensed with, saving coal and janitor's time. Allows the use of low priced coal (in boiler) for heating water. High city water pressure will not injure the Apartment Taco. Requires less head room than a tank with coil. Domestic water is being heated when there is no pressure on the boiler. Full supply of hot water at all times.



Installation on Cast Iron Boiler

On cast iron boilers, installed with several tappings and header as shown. On steel boilers one connection only is used.

Data and List Prices—Stock No. 628

Size	*Tank Capacity Gals.		Tank Connections Inches	Boiler Connections		Shpg. Weight Pounds	List Price
	Below Water-line	With live Steam		Tapping for Steel Boilers	No. and size Tappings for Sectional Boiler		
4	320	600	2	2″	4–1 ¼ inch	125	$100
5	640	1200	2 ½	2 ½″	4–1 ½ inch	175	200
6	960	1800	3	3″	6–1 ½ inch	250	300

Allow for extra load on boiler, 1 ½ square feet of radiation for each gallon of water heated per hour.

See page 215 for specification form.

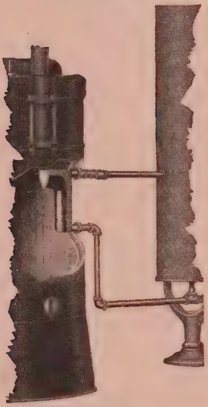
*Ratings Based on 100° F rise in 3 hrs.

UNIVERSAL TACO WATER HEATERS

No. 606

No. 607

For Heating Domestic Water Supply with Hot Water Boilers



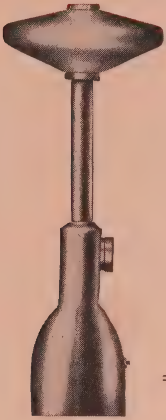
No. 606
Typical Installation of Universal Taco

Universal Taco Heaters supply water for domestic use from the fire pot of the heating boiler. They are better and more efficient than a pipe coil. Universal Taco Water Heaters are so designed as to set flush against the firepot wall and leave no air space to cause the fire to burn out around the heater. They have no fins or projections to catch ashes or to clinker up. They do not interfere with efficient firing.

Universal Taco Heaters are tapped for boilers having either 6″ or 9″ centers in coil openings. Can be fitted to coil openings of any dimensions by using nipple and elbow. Made in malleable iron and brass.

Size	Center to Center Inches	Tank Capacity Gallons	Shpg. Weight Pounds	Iron		Brass	
				Stock No.	List	Stock No.	List
6-9-30	6 or 9	30	10	606	$ 8.00	616	$20.00
6-9-60	6 or 9	60	17	607	14.00	617	35.00

NOTE: Where Universal Taco Heaters are used allow for extra load on boiler. For steam boilers 1½ sq. ft. of radiation for each gallon of tank capacity. Hot water boilers add 2½ sq. ft. of radiation for each gallon of tank capacity.



For Hot Water Heating

This Generator is designed to quicken the circulation and widen the range of temperature in hot water heating plants by producing a slight pressure within the system. Contains no valves or other moving parts. The system is "sealed" by means of a column of mercury. Cannot stick or fail to relieve. Shipped complete with mercury.

List Prices, Each

	Capacity Sq. ft. of Radiation	Pounds of Mercury	Shipping Weight Pounds	Price
Style 1, No. 537......	1,200	3	40	$25.00
Style 2, No. 538......	2,500	6½	60	35.00
Style 3, No. 539......	3,500	11	85	50.00
Style 4, No. 536......	10,000	15	90	65.00

Honeywell Tank in Basement Combination

The Honeywell Tank-in-Basement Combination consists of a special Honeywell Heat Generator and a No. 800 Arco Water Regulator. By the use of this combination, the expansion tank can be placed in the basement. The Arco Water Regulator is necessary for proper operation of this equipment.

List Prices

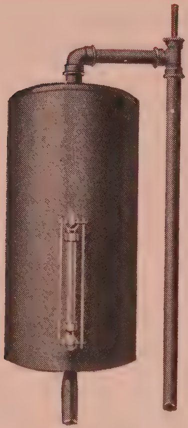
Including special generator and No. 800 Arco Regulator. For plants containing 2,500 square feet or less of radiation.

No. 771, Style 11, for one-story buildings..........$48.00

No. 772, Style 12, for two-story buildings.......... 52.00

No. 773, Style 13, for three-story buildings 56.00

Price on equipment for plants containing more than 2,500 square feet of radiation, or for buildings having more than three stories, furnished upon request.



Stock No. 491

These tanks are made of steel, heavily galvanized, and are good for full rated capacity.

Tapped top and bottom for 1-inch overflow and expansion pipe, and on side for feed pipe.

Water Gauge Tappings—½-inch—13½ inches between centers.

Note: Special tanks are required for "Tank-in-Basement" jobs or for any installation where tank is used under pressure.

Water Gauge: Stock No. 494—List price, $1.75. Weight, packed, 1¾ lb.

List Prices for Tanks

Style	Size Inches	Nominal Capacity Gallons	Square Feet of Radiation	Price of Tank
1	12x20	10	300	$ 8.00
2	12x30	15	500	9.00
3	14x30	20	700	12.50
4	16x30	26	950	14.00
5	16x36	32	1300	15.00
6	16x48	42	2000	16.50

IDEAL Expansion Tank Bracket

Stock No. 497

Takes all sizes of tanks, from 10 to 16 inches diameter. Labor-saving—can be attached in a few minutes. A substitute for the old-fashioned shelf, and at less expense. Made of cast iron. Weighs about 6½ pounds and is shipped with screws packed under the slide pieces.

List Price, each, complete, $1.75

BLACK STEEL STANDARD STORAGE TANKS

For Working Pressure Not Exceeding 65 lbs. per Sq. Inch

Stock No.	Size	Nominal Capacity Gallons	Approximate Weights	List Price
415	20 x 4	66	270	$ 94.00
416	20 x 5	85	310	104.00
420	24 x 4	100	330	109.00
421	24 x 5	120	380	123.00
422	24 x 6	140	440	134.00
428	30 x 4	150	430	143.00
429	30 x 5	180	500	158.00
430	30 x 6	220	560	173.00
431	30 x 7	250	630	196.00
432	30 x 8	295	700	211.00
438	36 x 6	315	700	206.00
439	36 x 7	365	780	241.00
440	36 x 8	420	870	256.00
442	36 x 10	525	1030	293.00
444	42 x 6	430	890	276.00
445	42 x 7	500	980	310.00
446	42 x 8	575	1070	333.00
448	42 x 10	720	1250	375.00
449	42 x 12	865	1430	415.00
699	42 x 14	1000	1620	468.00

Unless otherwise specified horizontal tanks will be shipped. All tanks regularly equipped with six tappings:

24″ Tanks 1½″ tappings

30″, 36″ and 42″ Tanks 2″ tappings

Hand-holes, list price, $8.00. Manholes in head, weight 100 pounds, list price, $30.00; in shell, weight 200 pounds, list price, $45.00. Extra openings, list price, 2 or 2½ inches, $8.00; 3 or 3½ inches, $9.00; 4 inches, $10.00. Tanks under 24 inches in diameter cannot be furnished with manhole. Tank legs, per set of three, list price, $3.00. Dimensions,—7¾ inches floor to tank; 8¼ inches over all.

Orders for tanks not subject to cancellation.

Prices of special tanks, galvanized tanks, tanks with coils, or tanks for working pressure higher than 65 lbs. on application.

IDEAL Retard Steam Gauges

Stock No. 579

With Bourdon Spring

This gauge is especially designed for house heating low pressure boilers. It provides great spread of scale between 0 and 10 lbs. with ¼-lb. graduations, thus making easy and accurate reading of the low pressures carried on heating boilers. Will register up to 30 lbs. Accurate and positive.

Size 4½ inches; steel case without back flange; hard rubber-finish; without cock.

List Price, each $12.00 Wt. 2 lbs. boxed. (Note.)

IDEAL Steam Gauges

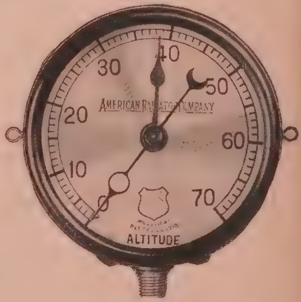
Stock No. 577

4½-inch steel case, without cock. Graduation 0 to 30 lbs. equally divided. List Price, $8.00. Weight 2 lbs. boxed. (Note.)

IDEAL Altitude Gauges

Indicate accurately, at the boiler, the height of water in the system.

EXPLANATION: When the water is at its proper level in expansion tank, remove the ring and glass, and set the stationary red hand at the pressure indicated by the working hand; whenever the pressure falls below this point, water should be added.



Stock No. 578

Size, 4½ inches; steel case without back-flange; no cock. Threaded ¼-inch pipe connection. List Price each, $12.00. Wt. 2 lbs. boxed.

NOTE.—All of above gauges can be furnished with customer's name on the dial if desired

COMBINATION
ALTITUDE GAUGE AND THERMOMETER

Stock No. 588

This instrument indicates height of water and temperature of water on the same dial. One instrument in place of two.

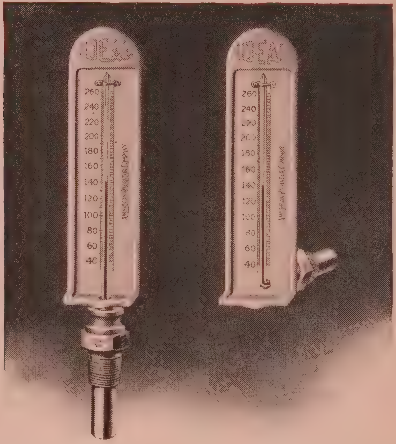
The temperature is indicated by the position of hand on a wide scale clearly marked in degrees Fahrenheit. Provides quick and easy reading of temperature. A great convenience on any job and of especial value if boiler is in a dark basement where it is difficult to read the ordinary glass thermometer. Saves contractor time and labor at installation.

Indicator for temperature is operated by the expansion of special thermostatic metal. Temperature of water is shown accurately at any degree. This instrument contains no mercury or liquids of any kind. Altitude Gauge operates by Bourdon Spring. Carefully made and tested.

Data: steel case, hard rubber finish, without cock. Rim removable. Threaded connection ½ inch, weight 2½ lbs. boxed.

Stock No. 588, { **3½ inch dial, List Price $12.00**
4½ inch dial, List Price $15.00

IDEAL HOT WATER THERMOMETERS



Straight	**Angle**
Stock No. 540	**Stock No. 541**

Made with steel case white enamel finish. Can be easily cleaned with damp cloth. Red liquid against white background makes easy reading of temperature.

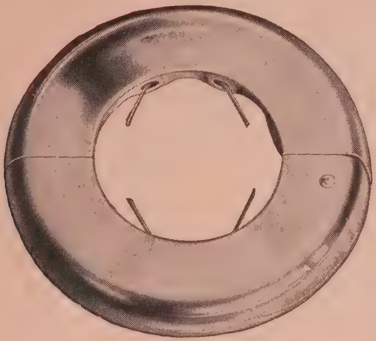
Well contains mercury bath insuring uniformity and accuracy of temperature indication.

If thermometer does not face in right direction when screwed up tight, slightly loosen small screw which is found on one of the faces of the hexagon and (without lifting) turn case to desired position, after which tighten screw.

Each thermometer is sent out carefully protected against damage in shipment. Customer's name on scale can be supplied. Thread on stem is ½-inch iron pipe size.

	List Price Each
Stock No. 540, Hot-Water Thermometer, straight, weight packed 1 lb.	$5.00
Stock No. 541 Hot-Water Thermometer angle (*for use on risers, or circulating pipe*), wt. pkd. 1 lb.	6.00

For Floor or Ceiling



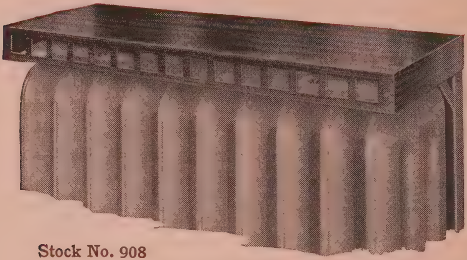
No. 707 N. P.
(Plain No. 706)

Made of heavy cold rolled steel. Copper-plated before nickeling. Highly polished. Steel springs hold plate firmly to pipe. Can be cut by shears to fit irregular installations. Made in sizes ½ inch to 4 inch.

List Prices

Size, Inches	½	¾	1	1¼	1½	2	2½	3	3½	4
No. 706, Plain, each. . .	.16	.17	.20	.22	.25	.30	.50	.65	.80	1.00
No. 707, Nickel, each. .	.27	.28	.32	.35	.38	.45	.65	.80	1.00	1.25
Weight (in lbs.) per doz. pk'd, Nos. 706, 707.	1	1	1¼	1½	1¾	2¼	2¾	3¼	4	4¼

DE LUXE ALL-STEEL RADIATOR COVERS



Stock No. 908

The De Luxe Cover prevents the formation of dark spots on the wall over radiators, by deflecting the air currents outward into the room.

The cover is constructed from full furniture steel with a 2-inch flange on all four sides. To assist circulation, the front of the cover is opened in large squares, $1\frac{1}{8}$ inches wide. The corners are electric and acetylene welded so that the cover is one solid piece of heavy smooth steel. Covers are made to fit any type of floor or wall radiator. Will not interfere with pipe connections.

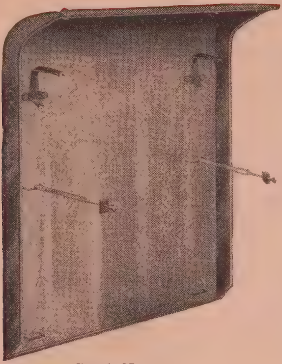
These covers are finished, according to specifications, to match the furniture or the wood trim of the room. The enamel wood finishes applied to the cover are smooth, beautifully grained and lasting. Mahogany, either light dark or brown, and walnut are particularly attractive, as is French grey enamel, a soft-toned finish that will harmonize well with any room done in neutral shades.

Use our special order blank to insure correct dimensions. We cannot be responsible for covers for which incorrect measurements are furnished. Orders for radiator covers not subject to cancellation.

List Prices

Style	For Rad. 30 inches long or less	Each additional inch
Finished any color or wood grain....	$20.00	$0.85
Plain steel, not painted............	18.00	.80

IDEAL RADIATOR SHIELDS



Stock No. 906

Can be readily fitted to Radiators of all varying constructions, as the brackets can be quickly shifted to connect with any make of Radiator. They do not interfere with the operation of the radiator valves or air valves, side piece being only 2 inches wide.

Trimmings furnished—Two cast iron top brackets (Part No. S-10), two adjustable hangers (each hanger consists of hook S-11, threaded rod S-12, knob S-13 and cast plate S-14) four loops S-15, necessary bolts.

Bottom loops on shield are used only to keep shield proper distance from the Radiator.

No hangers are furnished or necessary for bottom loops.

No. 26 gauge material regularly furnished.

As regularly made shield extends down to within 7 inches of the floor.

List Prices

Height of Radiator Inches	26 or lower 5 Sec. or less	32 and38 5 Sec. or less	44 5 Sec. or less	
Shields from Black Sheets......	$6.00	$6.40	$6.80	Radiators larger than 5 sec. add 20c for each additional section.
Shields from Galvanized Sheets.	7.20	7.60	8.00	Radiators larger than 5 sec. add 24c for each additional section.
Brass, having Galvanized Iron Backs	34.00	34.80	35.20	Radiators larger than 5 sec. add 60c for each additional section.
All Brass..........	36.00	38.00	39.20	Radiators larger than 5 sec. add $1.20 for each additional sec'n.
Black, painted or bronz'd plain colors	8.00	8.40	8.80	Radiators larger than 5 sec. add 60c for each additional section.
Galv., painted or bronz'd plain colors	9.20	9.60	10.00	Radiators larger than 5 sec. add 64c for each additional section.

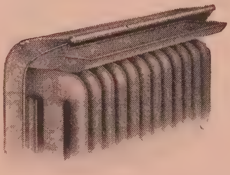
Add $4.00 to above List Prices for Black and Galvanized Vapor Pan.

Add $12.00 to list for Brass Vapor Pan.

Shields painted to order or to match decorations at extra charge.

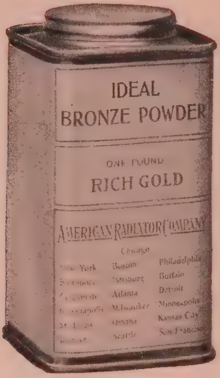
In ordering indicate (1) whether single, two, three, four column or Window Radiation; (2) name and height of Radiator; (3) number and length of sections.

Orders not Subject to Cancellation



Vapor-Pan Attachment (showing Pan Withdrawn)

IDEAL RADIATOR BRONZE



The use of a superior quality of bronze in the decorative treatment of Radiators adds greatly to the attractiveness of Radiator heating.

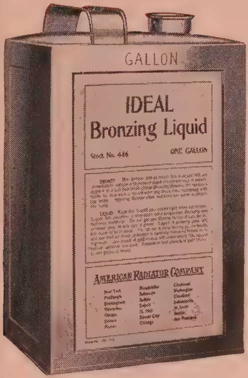
After many years of experiment and experience we offer a grade of bronze powder exactly suited to decorating Radiators. The bronze is made for special requirements, and a single trial will prove the exceptional brilliancy and durability of its luster, and large amount of surface per pound it covers.

Bronze Powder is put up in screw-top cans containing one pound. Aluminum is also put up in one-half pound cans. Gold Bronze (pale, rich and deep), Stock No. 652. Copper Bronze, Stock No. 653. Aluminum Bronze, Stock No. 654.

Directions for Use

BRONZE—Mix bronze into as much liquid as you will use immediately, sufficient to make it about the consistency of cream. Apply with a fitch brush (bear hair)—do not work it any more than necessary with the brush—cover surface, if possible, with one stroke of brush. Applying bronze when radiators are warm improves the luster.

LIQUID—Keep the liquid can closed tight when not in use. Liquid left uncorked a very short time evaporates and thickens, and becomes worthless. Do not get any bronze in liquid-can, as the smallest particle will turn it green. Liquid, if properly used, will not have to be thinned. Do not use a dirty mixing pot or brush, and see that all dried-up bronze is carefully removed before mixing fresh. One pound of bronze (except aluminum) will cover about 300 square feet of radiation; one pound of aluminum powder will cover about 600 square feet of radiation. One quart of liquid is required for each pound of bronze powder, except in the case of aluminum, for which the proportion is about one-half gallon of liquid to one pound of the powder.



Stock No. 646

For use with Gold and Aluminum Bronze Powders

Bronzing Liquid of high grade must be used with bronze powders to obtain satisfactory finish and lustre. The finest and most brilliant bronze cannot produce satisfactory results unless the liquid is of equally good quality. IDEAL Bronzing Liquid is specially prepared for us. It mixes quickly with the powder, flows evenly, and gives a hard varnish surface without dulling the lustre of the bronze. Put up in gallon, half gallon, and quart cans—weight of one gallon can, 8 lbs.

Black Asphaltum

For the painting of boilers and risers, we offer a Black Asphaltum of great covering capacity and durability, put up in one-gallon, half-gallon, and quart cans, and in barrels.

A first-class covering in every respect. Gives satisfaction to all who use this kind of varnish. Weight in cans 8½ lbs. per gallon.

Stock No. 647

For the convenience of Architects and Engineers, we are listing below the correct form for specifying IDEAL Heating Specialties.

IDEAL Packless Radiator Valves

Described on Pages 164-167

For Steam Heating

Each Radiator shall be equipped with a No. (give number of Valve and specify "IDEAL Super-Packless Valve" or "IDEAL Packless Valve", as desired) manufactured by the American Radiator Company.

For Hot Water Heating

(Same as above inserting words "drilled with circulating hole.")

For Vapor Heating

Each radiator shall be equipped with a No. 868 IDEAL Fractional Packless Valve, manufactured by the American Radiator Company.

DETROIT Equalizing Hot Water Valves

Described on Page 170

For Hot Water Heating

Each radiator shall be equipped with a No. 105 (or 104) DETROIT Equalizing Hot Water Radiator Valve.

DETROIT Multiport Vapor Valves

Described on Page 170

Fractional Valves for Vapor Heating

Each radiator shall be equipped with a No. 168 DETROIT Improved Multiport Vapor Valve.

IDEAL AIRID Siphon Valves

Described on Pages 177-179

For Venting Low Pressure Steam Radiators

Each radiator shall be equipped with a No. 500 IDEAL AIRID Siphon Valve, manufactured by the American Radiator Company.

IDEAL Air Line Valve

Described on Page 180

For Venting Steam Radiators Where Air Line or Drip Line is Used

Each radiator shall be equipped with a No. 816 IDEAL Air Line Valve, manufactured by the American Radiator Company.

IDEAL Quick Vent

Described on Page 181

For Venting Steam Mains and Risers

Install where shown on the plans on each steam main (if risers are to be vented insert the words "and riser") a No. 815 IDEAL Quick Vent, manufactured by the American Radiator Company.

IDEAL Vento Vent

Described on Page 181

For Venting Vento Stacks and Blast Coils

Install on each Vento Stack (or Blast Coil) and connect to drain by ¼″ pipe, a No. 817 IDEAL Vento Vent, manufactured by the American Radiator Company.

Honeywell Temperature Regulator

Described on Pages 194-197

For Room Temperature Control

Install a No.——(specify number of model) Honeywell Temperature Regulator with thermostat located in room (specify room) and make proper connections to dampers of heater.

ARCO Water Regulator

Described on Pages 183-187

For Damper Control on Hot Water Heating Boilers

Install on the Hot Water Heating Boiler and properly connect to dampers, a No. 800 ARCO Water Regulator, manufactured by American Radiator Company.

For Damper Control on Hot Water Supply Boilers

Install on the Hot Water Supply Boiler and properly connect to dampers, a No. 801 ARCO Junior Water Regulator, manufactured by American Radiator Company.

ARCO Tank Regulator

Described on Pages 190-192

For Temperature Control of Hot Water Storage Tanks Heated by Steam

Install on the hot water storage tank a No.——(specify number of style desired) ARCO Tank Regulator, manufactured by the American Radiator Company. The regulator to be of size——(specify size) and to have a temperature range of——degrees to——degrees (specify range desired.)

External Water Heaters

Described on Pages 198-201

For Heating Domestic Water Supply from Steam or Vapor Boiler

Install below the water line of the boiler and properly connect to the water tank a No.——(specify size of heater and name "Excelso", "Taco Domestic", or "Apartment Taco" as desired) Water Heater.

IDEAL ASBESTOS CEMENT

Stock No. 402

IDEAL Asbestos should be applied to a warm surface in thin coats; the first coat should be left a rough surface and allowed to dry. Mix with water and apply with a trowel, finishing with a wet brush. When dry give a coat of paint; or when applying last coat, mix Asbestos half and half with Portland Cement; final coat should be about 1/8 inch thick, with a very hard finish.

Amount of Cement required to cover IDEAL Boilers 1 1/4 inches thick:

Arco Round Steam and Water

No. of Boiler	Lbs.
1704	100
1705	125
1706	150
1904	125
1905	150
1906	175
2004	150
2005	175
2006	200
2204	150
2205	175
2206	200
2504	175
2505	200
2506	225
2804	200
2805	250
2806	275
3104	250
3105	300
3106	325

IDEAL Sectional Steam and Water

No. of Boiler	Lbs.
19–6	280
19 7	320
22–5	275
22 6	325
22-7	375
25–5	350
25–6	400
25–7	450
25–8	500
28–5	500
28–6	575
28–7	650
28–8	725
36–5	575
36–6	650
36–7	725
36–8	800
36–9	875

IDEAL Water Tube and IDEAL Smokeless Boilers

Steam and Water

No. of Boiler	Lbs.
2305	100
2306	125
2307	150
2308	175
2309	200
2310	225
2311	250
2905	175
2906	200
2907	250
2908	300
2909	350
2910	375
2911	400
3605	575
3606	650
3607	725
3608	800
3609	875
3610	950
3611	1025
3612	1100
3613	1175
3614	1250
4806	850
4807	950
4808	1050
4809	1150
4810	1250
4811	1350
4812	1450
4813	1550
4814	1650

List Prices

Asbestos Cement, per bag of 100 pounds....................$3.00

ENGINEERING DATA

FAMILIAR HEATING TERMS

What They Mean

Actual Evaporation.—By this term is meant the total quantity of water (in pounds) evaporated from any temperature of feed water into steam at any pressure. The heat used per pound depends on the feed water temperature and the pressure and temperature at which the steam is made.

Atmospheric Pressure.—This is the pressure due to the weight of the atmosphere. It is generally expressed in pounds per square inch or in inches of mercury column. To find the pressure in pounds per square inch, when expressed in inches of mercury column, multiply the latter by .491, which is accurate for mercury at 70° and near enough for most calculations for other temperatures.

Normal atmospheric pressure is 14.7 pounds per square inch.

The average atmospheric pressure for any locality depends on the altitude above sea-level.

Absolute Pressure.—The sum of the gauge and atmospheric pressure is called the absolute pressure.

Boiler Heating Surface (Direct).—That surface which receives the radiant heat of the fire, or that surface on which the fire shines.

Boiler Heating Surface (Indirect Flue).—That surface on which the fire does not shine, but with which the hot gases come in contact before reaching the smokehood.

The value of indirect surface depends on its position; on the velocity of gas particles over it; on the contact of the gas particles with it; on its cleanliness, or the ease with which it can be cleaned, and many other factors. Consequently, it is not possible to compare two boilers merely on heating surface.

B. t. u. (British Thermal Unit).—The quantity of heat required to raise 1 pound of water 1 degree Fahrenheit.

Calorie.—The Continental heat unit, or calorie, is the quantity of heat required to raise the temperature of 1 kilogram of water 1 degree Centigrade, and as 1 kilogram is equal to 2.205 pounds and 1 degree Centigrade is equal to 1.8 degrees Fahrenheit, it is obvious that one calorie measures the same quantity of heat as does 3.969 B. t. u. This is shown by multiplying 1.8 by 2.205. It is usual

when translating from the English and American standard to the Continental or Metric standard of heat measure to call 1 calorie equal to 3.97 B. t. u.

Calorific Value (Heat Value).—The heat in B. t. u. generated by the complete combustion of 1 pound of a solid or liquid fuel or 1 cubic foot of gaseous fuel at standard pressure and temperature.

For fuels containing hydrogen, two heat values may be found, the higher and the lower.

The higher or gross heat value is the heat obtained from complete combustion when the water vapor formed is condensed and thereby gives up its latent heat.

The lower or net heat value is the heat obtained when the water vapor formed during combustion escapes without condensing.

Calorimeter.—An apparatus for measuring quantities of heat.

Calorimeter, Bomb.—Used to determine the calorific value of a solid or liquid fuel.

A small weighed quantity of the fuel is placed in a cup in a closed shell filled with oxygen under pressure. By means of an electric spark or electrically heated wire the fuel is ignited. The heat generated by the fuel in burning is given to the water surrounding the "bomb." By knowing the weight of water, the temperature rise, the heat absorbed by the calorimeter and the heat lost by radiation, the heat generated by the fuel can be computed.

The heat value is generally determined for a sample from which the moisture has been removed by heating.

Calorimeter, Junkers.—Used to find the heat value of a gas. The gas is burned in a shell surrounded by circulating water. The water completely absorbs the heat given up by the gas. By measuring the gas at standard conditions and determining the quantity and temperature rise of the water, the heat given up by the gas or its heat value can be computed.

Clinker.—Clinker is slag caused by the fusing or melting together of the constituents of the ash. The extent to which fuel clinkers depends on the composition of the ash as well as the temperature at which it melts.

CO.—Symbol for carbon monoxide which denotes incomplete combustion of the carbon in the fuel.

CO_2.—Symbol for Carbon Dioxide, which is the result of complete combustion of the carbon in the fuel.

Coal, Caking.—Coal which fuses and becomes a pasty mass when heated, as opposed to free burning (non-caking coal).

Coal, Free-Burning (non-caking).—Coal which does not fuse together and become a pasty mass when heated, but burns freely.

Combustion Chamber.—That part of the boiler in which the fuel unites with the oxygen and burns.

Combustion, Rate of—The number of pounds of coal burned per square foot of grate per hour.

Condensation.—The change of a substance from a vapor into a liquid state due to cooling.

Condensing Power of Radiation.—The number of pounds of equivalent evaporation condensed by 1 square foot of radiation per hour for standard conditions.

Conduction—By conduction is meant the flow of heat through an unequally heated body, or system of bodies, from points of higher to points of lower temperature.

Convection—By convection heat is transferred by the bodily movement of heated particles of matter—such as carried by circulation of a liquid or a gas.

Efficiency of a boiler—Is the ratio expressed in percent of the heat absorbed per pound of dry coal burned, to the heating value of a pound of dry coal fired.

Equivalent Evaporation from and at 212°F—Is meant the number of pounds of water that would be evaporated from a feedwater temperature of 212°F into dry and saturated steam at 212°F by the expenditure of the same amount of heat as is actually used in evaporating the water under given conditions.

To find the equivalent evaporation if steam is not made under these conditions, compute the total heat used and divide by 970.4.

Evaporation—Is the process of transforming a substance from the liquid state into the gaseous state.

Evaporative Power.—The number of pounds of equivalent evaporation a boiler will evaporate from 1 pound of dry fuel burned.

FAMILIAR HEATING TERMS

Heating Surface.—All surfaces of a boiler which have hot gases on one side and steam or water on the other.

Heat Transmission—The passage of heat through any substance from a medium on one side of the substance to a medium on the other side of lower temperature.

For Example:—from the steam in a radiator to the air in the room through the radiator.

Heat Transmission, Co-efficient of.—The number of B.t.u. passing through 1 square foot of surface, in 1 hour, per degree difference in temperature of the gases, liquids or solids on the two sides of the surface.

Ignition Temperature.—The temperature to which a combustible must be raised to cause a rapid chemical union with oxygen.

Latent Heat,—that heat which changes the physical state of a substance without changing its temperature.

Latent Heat of Fusion.—The heat required to change a substance from a solid into a liquid state at the melting point.

Latent Heat of Evaporation.—The heat required to change a substance from a liquid to a vapor at the boiling point.

In speaking of steam, the term Latent Heat means the latent heat of evaporation.

Potential Energy.—Potential energy in speaking of boilers and hot water heaters has been used to denote the total amount of heat received by the water from charge of available fuel.

Radiation.—The transfer of energy from point to point in space by means of waves set up in the ether. The earth is heated by radiation from the sun.

Steam is water vapor.

Saturated Steam is water vapor at the temperature of the boiling point corresponding to the pressure in the condition in which it would be generated from the water at its pressure.

Wet Steam—is saturated steam which contains entrained moisture.

Dry Steam—is saturated steam which contains no entrained moisture.

Superheated Steam—is steam at a temperature higher than the temperature corresponding to the pressure of the boiling point at which it was formed.

Specific volume—of saturated steam at any pressure is the volume in cubic feet of one pound of steam at that pressure.

Specific Heat—is the relative amount of heat, compared with water as standard substance, required to raise unit mass of different substances one degree in temperature.

Thermometers—For measuring temperatures, but often supposed to be for measuring heat. They are, however, in no sense measures of heat, but give simply relative comparisons as to the degree of heat in the body measured; that is, a thermometer registering 180 degrees in one body, while in another a thermometer registers 60 degrees, shows that one body is 120 degrees warmer than the other.

THE FAHRENHEIT THERMOMETER ("F or "Fahr.") is used in America, Great Britain and the British Colonies. The Freezing point of water is taken at 32 degrees above zero, and the temperature of pure boiling water at 212 degrees. In both cases the measurement is recorded under the ordinary atmospheric pressure of 14.7 pounds per square inch. Between 32 and 212 degrees there are 180 degrees, which are usually spaced into 1-degree intervals.

THE CENTIGRADE THERMOMETER ("C"), known in Germany as "Celsius thermometer," is used in France and most other countries in Europe. 0 degrees or zero corresponds to the freezing point, or melting ice (which is marked 32 on the Fahrenheit scale), and 100 degrees to boiling water. From the freezing to the boiling point there are 100 degrees.

THE REAUMUR THERMOMETER ("R") is used in Russia, Turkev and Egypt. 0 degrees or zero corresponds

to melting ice, 80 degrees to boiling water. From freezing to boiling points there are 80 degrees.

Each degree Fahrenheit is $\frac{5}{9}$ of a degree Centigrade, and $\frac{4}{9}$ of a degree Reaumur. The Centigrade temperature interval between the freezing and the boiling point being 100 and the Fahrenheit interval 180, it follows that 1 degree Centigrade is equal to 1.8 degrees Fahrenheit.

Centigrade temperatures are converted into Fahrenheit's scale by multiplying the former by 9 and dividing by 5, and adding 32 degrees to the quotient; and conversely, Fahrenheit temperatures are converted into Centigrade scale by deducting 32 and taking $\frac{5}{9}$ of the remainder.

EXAMPLE:—Centigrade degrees $\frac{20\times 9}{5}=36$,

and $36+32=68$ degrees F.

Fahrenheit degrees $68-32=36$,

and $\frac{36\times 5}{9}=20$ degrees C.

Water.—Water presents a singular exception to the general law of expansion by heat. If water at 39.2 degrees is cooled, it expands as it cools till reduced to 32 degrees, when it solidifies in the form of ice; and if water at 39.2 degrees is heated it expands as the temperature increases in accordance with the general law.

For all practical purposes it is sufficiently accurate to say that:

1 cubic foot of water weighs 62.5 pounds.
1 cubic inch of water weighs 0.036 pound.
7.48 U. S. gallons equal 1 cubic foot.
6 Imperial gallons equal 1 cubic foot.
1 U. S. gallon weighs 8.33 pounds.
1 Imperial gallon weighs 10 pounds.

The pressure produced by a column of water is called the "static head." A head or column of water 1 foot high produces a pressure of 0.433 pound per square inch.

From the table on the following page (page 224) it will be seen that when the expansion tank is 20 feet above the boiler, the pressure per square inch at the boiler is 8.66 pounds, and the boiling point is 236.2 degrees.

With this temperature at the boiler, if there is no loss of heat in the piping, the temperature of the radiators on the first floor will not be higher than about 231 degrees, because they will be about 5 feet nearer the tank than is the boiler. The radiators on the second floor may carry a temperature not to exceed 219 degrees, because they are only 5 feet below the expansion tank.

The natural loss of heat in the piping will reduce these temperatures to some extent.

Pressures and Boiling Points of Water for given Static Heads

Height of Column, Feet	Pressure per Square Inch, pounds	Boiling Point at Boiler which is at the Bottom of the Column, Degrees Fahrenheit
2	0.866	214.9
3	1.299	216.3
4	1.732	217.6
5	2.165	219.0
6	2.598	220.3
7	3.031	221.6
8	3.464	222.8
9	3.897	224.1
10	4.330	225.3
15	6.500	231.0
20	8.660	236.2
25	10.830	241.2
30	12.990	245.7
35	15.160	249.9
40	17.320	253.8
45	19.490	257.7
50	21.650	261.3

An artificial pressure may be carried on a water-heating apparatus by closing the outlet of the tank by a safety-valve. This is done sometimes to increase the temperature of the water, and at other times to cause a more rapid circulation in remote parts of the apparatus.

The reason that the flow of water through the pipes is accelerated by increasing the pressure is because that with the higher temperature, due to the pressure, the rising line of pipe, or flow-pipe from the boiler, is emulsed

with steam, making it much lighter than the return column, and thus causing a more rapid circulation of the water through the system.

This principle is made use of by the French and Belgian heating engineers in nearly all of their water-heating apparatus, permitting them to use much smaller pipes than is considered good practice in this country. It is unlawful in those countries to place any pressure on the system other than the static head, and to prevent the escape of steam two or more condensing tanks are employed.

The rapidity with which the water flows through the piping of a French or Belgian emulsion system, which is due to the great difference in weight between the rising and falling column, causes it to circulate far below the boiler. There are systems of this kind in operation where the radiation is successfully heated 30 feet or more below the boiler. The same principle is employed in heating Pullman cars with hot water.

Boiler Capacity and Horse-power

Rating is a measure of a boiler's heat output. It is defined as the number of square feet of standard direct column radiation which a boiler will supply at its outlet in one hour, under standard conditions.

If the given time is 8 hours, the boiler is rated on an 8 hour basis. If this given time is 6 hours, the boiler is rated on a 6 hour basis.

For the purpose of rating **steam** boilers, 240 B. t. u. per hour equals 1 square foot of radiation.

For rating **water** boilers, 150 B. t. u. per hour equals 1 square foot of radiation.

One Boiler Horse-power is defined as the evaporation of 34½ pounds of water per hour from a feed water temperature of 212 degrees into steam at 212 degrees. This is equal to $34.5 \times 970.4 = 33478.8$ B. t. u. per hour.

One Boiler horse-power is equal therefore to

$$\frac{33478.8}{240} = 139 \text{ square feet of steam radiation.}$$

Note that Boiler horse-power is not derived from engine horse-power.

1 H. P. hour = 2545 B. t. u.

Miscellaneous Rules

To find the B. t. u. output per hour of a steam boiler, multiply the output in square feet by 240.

To find the B. t. u. output per hour of a water boiler, multiply the output in square feet by 150.

To find the output in square feet of steam radiation; divide the output in B. t. u. per hour by 240.

To find the output in square feet of water radiation; divide the output in B. t. u. per hour by 150.

The fuel capacity of a boiler is generally taken as the weight of the fuel from the grate to the center of the fire door.

The available fuel is generally taken as 80 per cent of the fuel capacity of the boiler. Its value is not constant, however, but depends on the type of fuel and boiler.

Ratings, efficiencies, firing periods and all other data should be determined from actual performance tests under proper conditions, and not from computations.

The following example illustrates the manner of computing the heat required to make a pound of steam under any conditions:

Problem.—Compute the quantity of heat required to change 1 pound of ice at 40 degrees below zero into steam at 7.05 pound gauge pressure with 80 degrees superheat when the atmospheric pressure is 11.86 pounds per square inch.

Solution.—The absolute pressure equals $7.05+11.86=18.91$ pounds per square inch. At 18.91 pounds boiling point equals 225 degrees Fahrenheit. Latent heat equals 962 B. t. u.

To raise 1 pound ice 1 degree Fahrenheit requires 0.5 B. t. u.

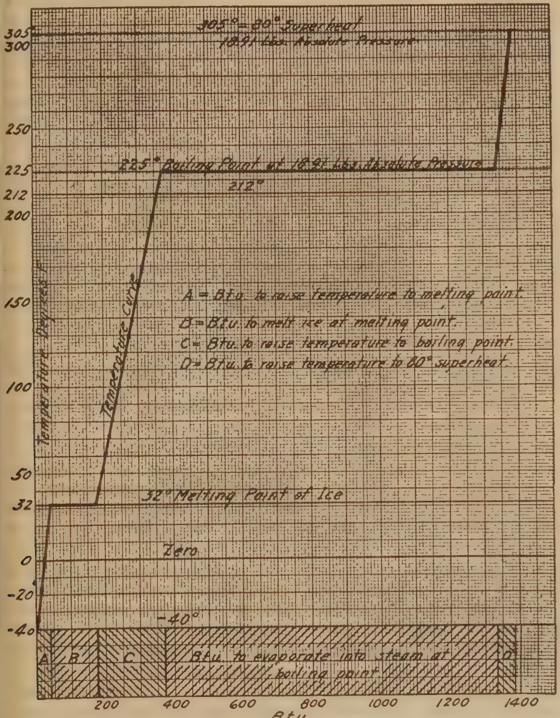
To raise 1 pound water 1 degree Fahrenheit requires 1.0 B. t. u.

To raise 1 pound steam 1 degree Fahrenheit requires 0.48 B. t. u.

To melt 1 pound ice at 32 degrees Fahrenheit requires 142.6 B. t. u.

		B. t. u.
Heat to raise temperature of ice to M. P.	$=72\times0.5=$	36.
Heat to melt ice at M. P.	=	142.6
Heat to raise temperature of water to B. P.	=	193.1
Heat to evaporate water at B. P.	=	962.
Heat to superheat steam 80 degrees	$=80\times.48=$	38.4
Total heat required...........................		1372.1

The problem is represented graphically in the diagram below from which a mental picture can be made of the various steps possible in the making of a pound of steam



Graphic representation of heat required to change 1 Lb. of ice at -40°F into steam at 7.05 Lbs gauge pressure with 80° superheat-Atmospheric pressure at 11.86 Lbs per Sq. In.

Anthracite, commonly known as *hard coal*, is practically all fixed carbon. It has a deep black color, a shiny, semi-metallic luster, few joints and clefts, and is compact and sometimes iridescent. The specific gravity ranges from 1.3 to 1.8. Anthracite neither softens nor swells when burning. It kindles slowly and with difficulty and burns with a short, yellowish flame, which changes to a faint blue and is transparent in appearance, owing to the absence of particles of solid carbon.

Semi-anthracite is not so hard or dense, and does not have the luster of true anthracite. It can be distinguished by the fact that when newly fractured it will soot the hand. The specific gravity is about 1.4. Semi-anthracite contains more gaseous matter, and for that reason kindles more readily and burns more rapidly than the true anthracite. It makes a very intense, free-burning fire.

Semi-bituminous coal is still softer than the semi-anthracite, and lacks most of the bright metallic luster, although it is brighter in appearance than bituminous coal. It contains more volatile hydrocarbon, kindles more easily and burns more rapidly than the anthracite, but resembles anthracite more than it does bituminous coal. It is ordinarily free-burning, without smoke, and has a high calorific value. It is of the highest class for steam generating purposes.

Bituminous coals are commonly called *soft coals*. They consist of fixed carbon and bitumen. This is a mixture of hydrocarbons, which, when heated, breaks down into gases, oils and tars. Bituminous coals have more volatile matter than the preceding classes. The range in specific gravity is from 1.25 to 1.4, and the color from dark brown to pitch black. In hardness they range from lignite to semi-bituminous. The harder varieties have the best heating values. Generally bituminous coals are brittle, with a vitreous, resinous or greasy luster. The distinction between semi-bituminous and bituminous coals is important economically, for the semi-bituminous have about 6% higher heating value per lb. of combustible, and burn with much less smoke. Bituminous coals absorb moisture from the atmosphere. The surface moisture will dry out naturally, but the moisture absorbed internally is driven out only at a temperature of 250° F. A distinguishing characteristic is a yellow flame and smoke when burning. There are two types of bituminous coals, designated generally as caking coals, and non-caking or free-burning coals. Caking coals are very rich in hydrocarbons, and valuable therefore in gas manufacture. They fuse and swell when heated. Non-caking coals do not fuse, but

hold their shape, burn much more freely, and are preferable for steam purposes.

Sub-bituminous coal is frequently called black lignite. Its chief characteristic is its tendency to absorb moisture if exposed to the weather, and to slake like lime. It has a fairly bright luster.

Lignite is vegetable matter in the early stages of coal formation. The specific gravity ranges from 1.2 to 1.23. When first mined, it may contain up to 50% of moisture. The color is light brown, showing a distinct woody structure in the poorer varieties, ranging to black with a pitchy luster resembling hard coal, in the best varieties. It is non-caking, and burns with a slightly smoky flame, with moderate heat. It is easily broken, and will not stand handling in transportation. The ash content of lignite ranges from 1 to 50%.

Peat is organic matter in the first stages of conversion to coal. It is found in bogs. It contains 75 to 95% of moisture when dredged and retains 15 to 20%, or even 30% when air dried. When air dried it contains about 7,500 BTU per lb. Large deposits are found in this country, but as yet are little used.

Coke is the somewhat porous material remaining after the volatile constituents of coal have been driven off. It consists almost entirely of fixed carbon and ash, and has an average heating value of 14,300 BTU per lb.

Classification and Heating Value of Coals

	Volatile Matter per Cent of Combustible	Oxygen in combustible per Cent	Moisture in Air Dry Coal Free from ash per cent	B. T. U. per lb. Combustible	B. T. U. per lb. Coal Air Dry Ash Free
1 Anthracite	less than 10	1 to 4	less than 1.8	14800–15400	14600–15400
2 Semi-anthracite	10 to 15	1 to 5	less than 1.8	15400–15500	15200–15500
3 Semi-bituminous	15 to 30	1 to 6	less than 1.8	15400–16050	15300–16000
4 Cannel*	45 to 60	5 to 8	less than 1.8	15700–16200	15500–16050
5 Bituminous, High Grade	30 to 45	5 to 14	1 to 4	14800–15600	14350–15500
6 Bituminous, Medium Grade	32 to 50	6 to 14	2.5—6.5	13800–15100	13400–14400
7 Bituminous, Low Grade	32 to 50	7 to 14	5 to 12	12400–14600	11300–13400
8 Sub-bituminous and Lignite	27 to 60	10to33	7 to 26	9600–13250	7400–11650

*Eastern Cannel. The Utah Cannel is much lower in heating value.

NAMES AND SIZES OF COAL

Anthracite

Anthracite is almost always sized, that is, screened. The commercial names of different sizes of coals are given in the following table. The coal of a stated size will pass through the larger openings and over the smaller openings in a metal screen.

Trade Name	Standard Square Mechanical Screen, size of Holes in ins.	
	Passes Through	Passes Over
Broken	4	2¾
Egg	2¾	2
Stove	2	1⅜
Chestnut	1⅜	¾
Pea	¾	½
No. 1 Buckwheat	½	¼
No. 2 Buckwheat (Rice)	¼	⅛
No. 3 Buckwheat (Barley)	⅛	1/16
Culin	....	Residue from Screening

Bituminous

There is no classification of sizes of bituminous coals which holds good in all localities. The American Society of Mechanical Engineers suggests the following:

Eastern Bituminous Coal

(a) Run-of-mine; unscreened coal taken from the mine.

(b) Lump; coal passing over 1¼-in. mesh bar screen.

(c) Nut; coal passing through a 1¼-in. bar screen, and over ¾-in. bar screen.

(d) Slack; coal passing through a ¾-in. bar screen.

Western Bituminous Coal

(a) Run-of-mine; unscreened coal taken from the mine.

(b) Lump; this group is divided in several different ways, 6-in., 3-in. and 1¼-in. lumps, according to the diameter of the circular openings over which the respective grades pass. They are also grouped as 6 x 3 in. and 3 x 1¼-in. lumps. The coal passes through the larger opening, and over the smaller.

(c) Nut; this is also divided into different sizes, 3-in. steam nut passes through a 3-in. diameter opening, and over a 1¼-in. opening. 1¼ in. passes through a ¾-in. and over a ⅝-in. opening.

(d) Screenings; coal passing through ¼-in. diameter opening.

Coke

Trade Name	Standard Square Mechanical Screen Size of holes inches	
	Passes Through	Passes Over
Egg	3	2½
Large Stove	2½	2
Small Stove	2	1½
Nut	1½	¾
Pea	¾	½

COAL OF THE UNITED STATES

(Taken from *Bureau of Mines* Bulletins.)

(*) indicates samples from car deliveries all others are mine samples.

County Bed or Local Name	Proximate Analysis "As Received"				Heating Value B.T.U. per Lb.		Character of Coal See page 235
	Moisture	Volatile Matter	Fixed Carbon	Ash	"As Received"	Dry	
Alabama	%	%	%	%			
Bibb, Belle Ellen	3.16	31.05	59.56	6.23	14,141	14,602	B. C.
Jefferson, Dolomite	3.16	25.40	67.75	3.69	14,616	15,093	B. C.
Jefferson, Littleton	2.53	26.94	59.48	11.05	13,286	13,631	B. C.
St. Clair, Davis (Tillman Sta.)	3.39	30.69	57.08	8.84	13,363	13,832	B.
Shelby Straven	3.83	32.03	58.66	5.48	13,799	14,349	B.
Tuscaloosa, Abernant	2.62	24.18	64.11	9.09	13,729	14,098	B. C.
Alaska							
Alaska Peninsula, Chignik Bay, Thompson Valley	10.77	30.37	43.99	14.87	9,641	10,805	Su. B.
Bering River, Hartline	4.75	13.72	63.31	18.22	10,820	11,360	B.
Cook Inlet, Port Graham	19.96	38.73	32.46	8.85	8,793	10,986	L.
Matanuska, Matanuska River	1.72	24.36	58.97	14.95	12,585	12,805	B.
Seward Peninsula, Chicago Creek	37.82	26.14	32.16	3.88			L.
Arizona							
Navajo, Oraibi	9.88	32.64	46.86	10.62	10,800	11,984	B.
Arkansas							
Logan, Paris	2.77	14.69	73.47	9.07	13,774	14,166	Se. B.
Pope, Russellville	2.07	9.81	78.82	9.30	13,702	13,992	Se. B.
Sebastian, Greenwood	3.21	14.84	72.66	9.29	13,588	14,039	B.
California							
Monterery, Stone Canyon	6.95	46.69	40.13	6.23	12,447	13,377	B.
Colorado							
Boulder, Lafayette	19.15	30.82	44.27	5 76	9,616	11,894	Su. B. F.
El Paso, Pikeview	26.20	29.67	37.67	6.46	8,352	11,317	Su. B. F.
Garfield, Newcastle	4.45	42.05	49.56	3.94	13,129	13,740	B.
Montezuma, Cortez	3.89	37.01	46.58	12.52	12,341	12,840	B.
Weld, Platteville	28.90	28.83	37.25	5.02	8,465	11,906	Su. B. F
Georgia							
Chattooga, Menlo	3.80	15.88	65.83	14.49	12,791	13,296	B.
Idaho							
Fremont, Haden	11.45	37.24	47.01	4.30	12,094	13,658	B.
Illinois							
Clinton, *Germantown	11.35	34.62	40.63	13.40	10,733	12,107	B. F.
Franklin, Zeigler	11.82	27.66	55.10	5.42	11,961	13,564	B. F.
LaSalle, *Lasalle	12.39	36.89	41.80	8.92	11,399	13,011	B. F.
Macoupin, *Staunton	13.54	35.69	40.03	10.74	10,807	12,499	B. F.
Madison, Collinsville	12.70	36.36	41.47	9.47	10,989	12,588	B. F.
Marion, *Centralia	9.95	34.76	42.06	13.23	10,960	12,171	B. F.
Montgomery, Panama	13.31	33.62	41.34	11.73	10,548	12,167	B. F.
St. Clair, *Shiloh	11.69	35.70	39.42	13.19	10,699	12,115	B. F.
Saline, Harrisburg	6.01	32.37	54.32	7.30	12,793	13,611	B. F.

County Bed or Local Name	Proximate Analysis "As Received"				Heating Value B.T.U. per Lb.		Character of Coal See page 235
	Moisture	Volatile Matter	Fixed Carbon	Ash	"As Received"	Dry	
	%	%	%	%			
Sangamon, *Auburn	16.00	32.41	37.82	13.77	9,940	11,833	B.
Williamson, Carterville	9.18	27.30	55.40	8.12	12,015	13,229	B. F.
Williamson, Herrin	8.80	29.85	53.83	7.52	12,222	13,401	B. F.
Indiana							
Clay, *Brazil	16.91	26.85	38.87	17.37	9,524	11,462	B. F.
Greene, *Linton	13.58	32.07	46.20	8.15	11,419	13,213	B.
Knox, *Bicknell	12.08	32.48	44.42	11.02	11,011	12,524	B.
Parke, *Rosedale	10.72	39.29	41.42	8.57	11,767	13,180	B. F.
Pike, *Littles	11.12	36.98	42.55	9.35	11,549	12,994	B.
Sullivan, Dugger	13.48	32.51	48.38	5.63	11,788	13,625	B. C.
Vigo, *Macksville	12.82	34.80	42.08	10.30	11,119	12,754	B. C.
Warrick, Elberfeld	9.69	38.59	41.04	10.68	11,412	12,636	B.
Iowa							
Appanoose, *Centerville	14.08	35.59	39.37	10.96	10,723	12,480	B.
Lucas, *Chariton	15.39	30.49	41.49	12.63	10,242	12,105	B.
Polk, *Altoona	13.88	36.94	35.17	14.01	10,244	11,895	B.
Wapello, *Laddsdale	8.24	30.74	45.02	16.00	11,027	12,017	B
Kansas							
Cherokee, *Seammon	2.50	33.80	51.25	12.45	12,900	13,230	B. C.
Crawford, Fuller	4.85	33.53	52.52	9.10	12,942	13,602	B. C.
Leavenworth, Lansing	11.10	35.51	40.69	12.70	11,065	12,447	B.
Linn, *Jewett	9.04	29.69	45.55	15.72	11,142	12,249	B. C.
Kentucky							
Johnson, Flambeau	2.36	48.40	38.75	10.49	13,770	14,103	B. F.
Muhlenberg, Central City	8.73	37.76	45.93	7.58	12,208	13,376	B. C.
Ohio, McHenry	9.89	35.94	43.36	10.81	11,392	12,642	B. C.
Pike, Hellier	3.73	30.01	59.42	6.84	13,649	14,178	B. C.
Webster, Wheatcroft	6.29	31.97	54.13	7.61	12,874	13,738	B. C.
Maryland							
Allegany, Eckhart	2.70	14.50	74.00	8.80	13,910	14,296	Se. B. C.
Allegany, Frostburg	3.20	14.50	75.60	6.70	14,100	14,566	Se. B.
Allegany, Lord	2.26	16.05	75.86	5.83	14,483	14,818	B.
Allegany, Midland	3.10	15.50	74.50	6.90	14,070	14,520	B.
Allegany, Washington	3.40	15.00	75.10	6.50	14,160	14,658	Se. B.
Michigan							
Saginaw, Saginaw	11.91	31.50	49.75	6.84	11,781	13,374	B. F.
Missouri							
Adair, Kriksville	15.98	38.15	37.18	8.69	10,798	12,852	B.
Caldwell, Hamilton	10.99	35.00	41.37	12.64	11,093	12,463	B.
Henry, Windsor	13.51	33.24	41.88	11.37	10,779	12,463	B.
Lafayette, Napoleon	13.44	32.00	40.27	14.29	10,232	11,821	B.
Macon, Bevier	16 25	33.38	40.97	9.40	10,625	12,687	B.
Ray, Richmond	13.56	34.29	40.66	11.49	10,771	12,461	B.
Montana							
Carbon, Bear Creek	9.67	35.92	46.39	8.02	10,832	11,992	B.
Cascade, Geyser	8.67	25.72	50.36	15.16	10,127	11,088	B.

County Bed or Local Name	Proximate Analysis "As Received"				Heating Value B.T.U. per Lb.		Character of Coal See page 235
	Moisture	Volatile Matter	Fixed Carbon	Ash	"As Received"	Dry	
Montana (Cont'd)	%	%	%	%			
Custer, Miles	29.13	25.33	30.51	15.03	6,662	9,400	L.
Fergus, Lewistown	15.35	28.27	48.08	8.30	10,615	12,540	B.
Missoula, Missoula	24.70	29.33	26.11	19.86	6,727	8,934	L.
Yellowstone, Musselshell	16.66	27.85	48.07	7.42	10,226	12,274	L.
New Mexico							
Colfax, Raton	2.12	36.06	50.22	11.60	12,965	13,246	B.
Lincoln, White Oaks	2.52	34.63	45.99	16.86	11,956	12,265	B.
M'Kinley, Blackrock	14.69	34.93	41.56	8.82	10,809	12,670	B.
North Dakota							
Morton, Leith	36.18	29.77	25.35	8.70	6,700	10,498	L. F.
M'Lean, *Wilton	35.96	31.92	24.37	7.75	7,069	11,038	L. F.
Stark, *Lehigh	35.38	29.59	25.68	9.35	6,923	10,713	L. F.
Williams, *Williston	36.78	28.16	29.97	5.09	7,204	11,395	L. F.
Ohio							
Belmont, *Bellaire	4.14	39.30	47.18	9.38	12,874	13,430	B. C.
Guernsey, *Danford	6.65	33.94	48.86	10.55	12,179	13,047	B. C.
Jackson, *Wellston	7.71	38.32	42.02	11.95	11,515	12,477	B.
Jefferson, Amsterdam	3.50	37.98	51.08	7.44	13,286	13,768	B.
Noble, Belle Valley	5.15	37.34	49.00	8.51	12,733	13,424	B. C.
Perry, *Dixie	7.55	38.00	46.08	8.37	12,128	13,116	B.
Oklahoma							
Coal, Lehigh	7.07	36.41	45.68	10.84	11,468	12,340	B.
Haskell, McCurtain	2.70	21.07	69.88	6.35	14,098	14,489	B.
Pittsburg, Carbon	2.09	27 59	50.25	20.07	11,695	11,945	B.
Pittsburg, McAlester	3.58	32.11	59.04	5.27	13,615	14,121	B.
Oregon							
Coos, Beaver Hill	16.10	31.10	39.63	13.17	9,031	10,764	Su.B.F.
Pennsylvania							
Allegheny, Bruceton	2.73	36.03	54.98	6.26	13,815	14.203	B. C.
Allegheny, Oak Station	3.48	35.15	55.45	5.92	13,700	14,194	B. C.
Allegheny, Scott Haven	2.60	32.67	59.41	5.32	14,085	14,461	B. C.
Bedford, Hopewell	1.58	16.32	69.98	12.12	13,408	13,623	B. C.
Cambria, Barnesboro	2.87	21.44	69.23	6.46	14,177	14,596	B. C.
Cambria, Beaverdale	3.44	16.18	73.46	6.92	14,114	14,617	B. C.
Cambria, Carrolltown Road	93	23.10	69.29	6.68	14,485	14,621	B. C.
Cambria, Fallen Timber	3.34	24.06	62.75	9.85	13,618	14,089	B. C.
Cambria, Hastings	2.89	23.67	66.34	7.10	14,107	14,527	B.
Cambria, Johnstown	1.32	14.63	75.24	8.81	14,047	14,235	B. C.
Cambria, Nanty	2.84	19.78	70.89	6.49	14,285	14,703	B. C.
Cambria, Portage	3.52	17.32	73.27	5.89	14,278	14,799	B. C.
Cambria, St. Benedict	2.94	19.52	70.87	6.67	14,143	14,571	B. C.
Cambria, Van Ormer	2.73	24.98	63.64	8.65	13,860	14,249	B. C.
Cambria, Vintondale	3.63	18.63	71.20	6.54	14,119	14,651	B. C.

County Bed or Local Name	Proximate Analysis "As Received" Moisture	Volatile Matter	Fixed Carbon	Ash	Heating Value B.T.U. per Lb. "As Received"	Dry	Character of Coal See page 235
	%	%	%	%			
Cambria, Windber	3.30	12.50	77.90	6.33	14,340	14,829	B. C.
Center Osceola Mills	2.08	21 46	69.87	6.59	14,274	14,577	B. C.
Clarion, Blue Ball Station	1.90	22.00	66.30	9.80	13,760	14,027	B.
Clearfield, Boardman	2.95	21.29	66.92	8.84	13,901	14,324	B. C.
Clearfield, Philipsburg	.90	21.59	68.49	9.02	14,060	14,188	B. C.
Clearfield, Smoke Run	3.73	20.29	68.41	7.57	13,970	14,511	B. C.
Fayette, Connellsville	3.24	27.13	62.52	7.11	13,919	14,385	B. C.
Indiana, Clymer	2.06	24.46	66.09	7.39	14,170	14,468	B. C.
Indiana, Glen Campbell	3.08	27.32	61.16	8.44	13,772	14,210	B. C.
Jefferson, Sykesville	2.44	28.44	60.88	8.44	13,732	14,075	B. C.
Lackawanna, Dunmore	3.43	6.79	78.25	11.53	12,782	13,236	A. F.
Luzerne, Pittston	2.19	5.67	86.24	5.90	13,828	14,138	A. F.
Schuylkill, Minersville	2.76	2.48	82.07	12.69	12,577	12,934	A. F.
Schuylkill, Tower City	3.33	3.27	84.28	9.12	13,351	13,811	A. F.
Somerset, Jerome	1.44	15.21	73.38	9.97	13,799	14,001	B. C.
Somerset, MacDonaldton	1.03	16.03	72.57	10.37	13,700	13,843	B. C.
Somerset, Windber	2.40	13.50	77.80	6.31	14,370	14,723	B. C.
Sullivan, Lopez	3.16	8.59	78.08	10.17	13,376	13,812	B. C.
Washington, Marianna	1.44	34.61	57.77	6.18	14,242	14,450	B. C.
Westmoreland, Greensburg	2.14	30.02	58.81	9.03	13,662	13,961	B. C.
Rhode Island							
Newport, Portsmouth	22.92	2.78	58.37	15.93	8,528	11,064	A. F.
Providence, Cranston	4.54	3.01	78.69	13.76	11,624	12,177	A. F.
South Dakota							
Perkins, Lodgepole	33.16	24.68	27.81	8.35	6,307	10,367	L. F.
Tennessee							
Anderson, Briceville	1.70	35.02	53.14	10.14	13,462	13,695	B.
Campbell, Lafollette	2.92	32.04	58.23	6.81	13,514	13,920	B.
Rhea, Dayton	1.76	27.86	49.57	20.81	11,666	11,875	B.
Texas							
Houston, Crockett	34.70	32.23	21.87	11.20	7,056	11,495	L. F.
Wood, Hoyt	33.71	29.25	29.76	7.28	7,348	11,085	L. F.
Utah							
Carbon, Sunnyside	5.96	38.68	48.77	6.59	12,841	13,655	B. C.
Emery, Emery	3.93	40.92	49.22	5.93	12,965	13,495	B.
Iron, Cedar City	10.35	36.33	43.70	9.62	10,874	12,129	B.
Summit, Coalville	14.20	36.00	44.80	5.00	10,630	12,389	B.
Virginia							
Henrico, Gayton	2 81	25.70	62.47	9.02	13,493	13,883	B.
Lee, Darbyville	3.42	34.36	58.83	3.39	14,134	14,634	B. C.
Russell, Dante	2.76	34.96	56.51	5.77	14,148	14,550	B. C.
Tazewell, Pocahontas	3.50	15.50	76.80	4.20	14,630	15,161	B. C.
Wise, Georgel	2.48	31.71	60.30	5.51	14,252	14,614	B. C.

COAL OF THE UNITED STATES

County Bed or Local Name	Proximate Analysis "As Received"				Heating Value B.T.U. per Lb.		Character of Coal See note below
	Moisture	Volatile Matter	Fixed Carbon	Ash	"As Received"	Dry	
Washington	%	%	%	%			
King, Black Diamond	7.98	37.69	45.95	8.38	11,732	12,749	B. F.
King, Cumberland	5.84	31.32	36.46	26.38	9,529	10,120	B. F.
Kittitas, Roslyn	3.89	37.00	46.49	12.62	12,434	12,937	B. C.
Pierce, Carbonado	3.81	26.60	49.33	20.26	11,518	11,974	B. C.
Thurston, Centralia	25.08	32.25	34.02	8.65	8,170	10,906	Su. B.
West Virginia							
Fayette, Carlisle	4.95	18.16	73.75	3.14	14,434	15,186	B. C.
Fayette, Fayette	3.22	22.28	71.68	2.82	14,702	15,191	B. C.
Fayette, Hawks Nest	5.00	24.50	67.20	3.30	14,280	15,032	B. C.
Fayette, Kay Moor	3.17	25.11	68.81	2.91	14,584	15,061	B. C.
Fayette, MacDonald	3.22	17.53	76.46	2.79	14,760	15,251	B. C.
Fayette, Page	3.32	28.88	62.72	5.08	14,209	14,697	B. C
Fayette, Sun	2.94	19.69	68.67	[illegible].70	13,786	14,204	B. C.
Logan, Holden	1.66	32.89	59.94	5.51	14,126	14,364	B. C.
M'Dowell, Ashland	2.80	14.50	77.40	5.33	14,550	14,969	Se. B. C.
M'Dowell, Big Four	2.30	16.98	76.21	4.51	14,636	14,981	B. C.
M'Dowell, Coalwood	2.19	13.91	75.25	8.65	13,995	14,308	Se. B. C.
M'Dowell, Eckman	3.32	16.22	76.35	4.11	14,587	15,088	B. C.
M'Dowell, Ennis	3.25	14.46	78.05	4.24	14,571	15,060	Se. B.
M'Dowell, Powhatan	2.55	13.44	78.57	5.44	14,569	14,950	Se. B.
M'Dowell, Roderfield	2.32	16.76	69.80	11.12	13,514	13,835	B. C.
M'Dowell, Worth	3.00	13.00	78.80	5.23	14,500	14,948	Se. B.
Marion, Monogah	2.95	35.01	56.44	5.60	13,862	14,283	B.
Mercer, Coaldale	3.43	14.58	77.89	4.10	14,602	15,121	Se. B.
Mercer, Wenonah	3.58	13.17	79.10	4.15	14,598	15,140	Se. B.
Monongalia, Richard	1.63	28.42	62.01	7.94	13,937	14,168	B. C.
Preston, Masontown	1.40	26.40	62.92	9.28	13,808	14,004	B. C.
Raleigh, Sophia	3.30	14.00	77.60	5.14	14,490	14,984	Se. B.
Raleigh, Stonewall	3.02	16.06	78.75	2.17	15,001	15,468	B. C.
Tucker, Thomas	1.12	20.74	70.38	7.76	13,800	13,956	B. C.
Wyoming							
Bighorn, Cody	17.29	31.33	45.89	5.49	10,055	12,157	Su. B.
Carbon, Hanna	11.45	42.58	39.33	6.64	10,890	12,298	B. F.
Fremont, Hudson	21.27	32.83	42.75	3.15	9,779	12,421	Su. B. F.
Hot Springs, Kirby	15.86	33.01	47.39	3.74	10,984	13,054	B.
Sweetwater, Superior	16.02	33.63	47.60	2.75	10,849	12,919	Su. B.
Sheridan, Monarch	23.88	34.33	38.44	3.35	9,335	12,264	Su. B. F.

*AF—Anthracite, free burning
B—Bituminous
B. C.—Bituminous Caking
B. F.—Bituminous, free burning
Su. B.—Sub-bituminous
Su. B. F.—Sub-bituminous, free burning
Se. B.—Semi-bituminous (smokeless)
Se. B. C.—Semi-bituminous, caking
L. F.—Lignite, free burning

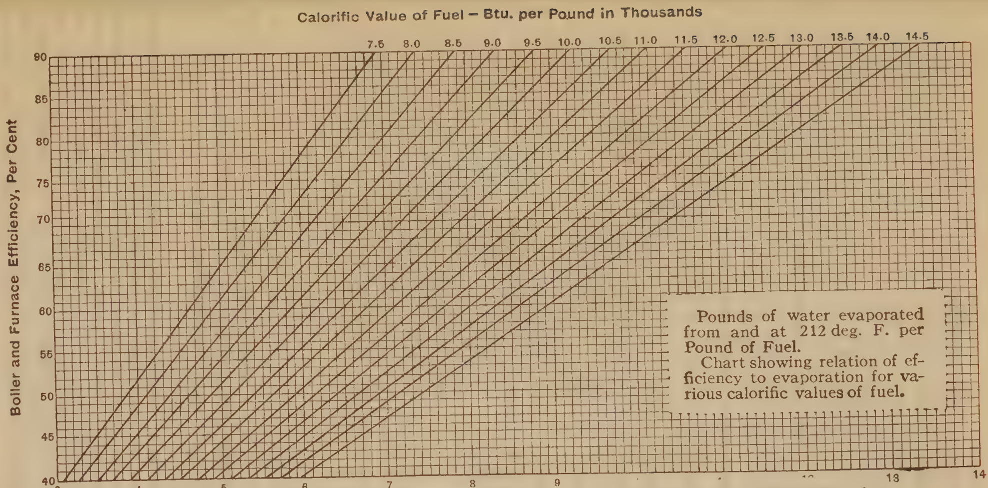
Comparative Heating Values of Wood and other Solid Fuels (Air Dried)

L. P. Breckenridge

	B. T. U. per lb.	Weight lbs. per Cord	Lbs. of 13500 B. T. U. Coal Equivalent to 1 cord of wood
Straw	5100		
Lignite	5200-7500		
Chestnut, Elm	5400	2350	940
Beech	5400	3250	1300
White Oak	5400	3850	1540
Hickory	5400	4500	1800
Cherry	5420	3140	1260
Ash	5450	3520	1420
Hard Maple, Walnut, Red Oak	5460	3310	1340
Live Oak	5460	3850	1560
Birch	5580	2880	1190
Tanbark	6100		
Hemlock	6410	1220	580
Yellow Pine, Poplar	6660	2130	1050
White Pine, Spruce, Willow	6830	1920	970
Pear, Air-dried	7500		
Corn	7200-8200		
Bagasse	8300		

Weight of Anthracite Coal per Cubic Foot

Grate	55.5 lbs.
Egg	53.2 "
Stove	52.6 "
Nut	51.8 "
Pea	51.6 "
Buckwheat	49.2 "



From above chart the equivalent Evaporative Power of a boiler can be determined when the boiler efficiency and heating value of the coal are known.

For example: A boiler having an efficiency of 60%, and burning 13,000 B.t.u. coal, has an equivalent evaporative power of 8.

COAL AND COMBUSTION RATES

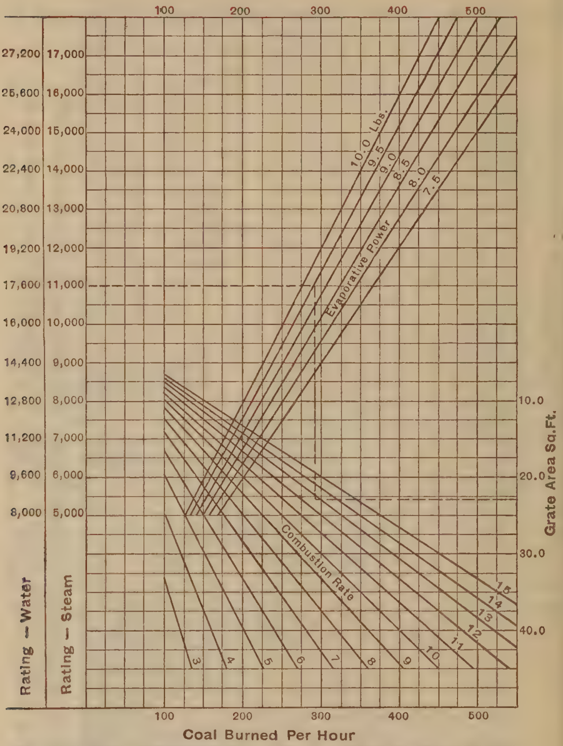


CHART FOR DETERMINING COAL BURNED PER HOUR AND COMBUSTION RATE

From this chart the combustion rate of a given boiler can be determined when the evaporative power and output are known.

For example: To determine combustion rate of a boiler of 11000 sq. ft. steam output-Evaporative power 9.5 pounds- and grate area 23 sq. ft., proceed as follows. Follow horizontally on the line of 11000 sq. ft. output shown on left hand side of page to intersection with evaporative power line 9.5 then downward to intersection of horizontal line showing 23 sq. ft. grate area, at the intersection of these two lines read combustion rate, which is approximately 13 pounds per sq. ft. of grate.

Oil Fuels

Petroleum in its crude form is a mixture of a number of hydrocarbons, which can be separated by fractional distillation. While the raw product is sometimes used as fuel, the usual practice is to "top off" the more volatile gasoline, naphtha, kerosene and gas oil, not only conserving these valuable products, but reducing the fire hazard of the residual oil. Oils of the paraffin or saturated-base type, from the Appalachian range and Middle West, are dark brown in color, with a greenish tinge. The residuum from these usually contains such valuable lubricating stock as to preclude its use for fuel. The asphaltic base oils, from Texas, California and Mexico, run from reddish brown to black, and quantities of residuum from these are available because of the large market for the volatile distilled from them. The olefine-group oils, from Russia, are also suitable, and Panuco crude oil from Mexico retains so little volatile after handling and transportation as to be available without refining.

Fuel oils consist almost entirely of carbon and hydrogen, and their heating value depends on the amounts of these constituents by ultimate analysis, being little influenced by the composition or volatility of the compounds in which they exist. The principal factors determining the availability of a fuel oil are its price on a heat unit basis, its freedom from grit, acid, fibre and sulphur and the possession of a flash point over 150° F. and a viscosity that will enable it to be pumped at 60° F.

Oil is sold by volume, on the basis of 42-gallon barrels, and as it averages 8 lb. per gallon, a barrel represents about 336 lb. Investigation of its specific gravity is important in its purchase and sale. Commercially this is ascertained by a Baumé hydrometer, which is a standard, weighted, glass bulb with a graduated rod indicating the depth to which it sinks in the fluid under test.

FUEL OIL DATA

Degrees Baume (Modulus 140)	Specific Gravity 60°–60° F.	Pounds per Gal.	Pounds per Bbl. of 42 Gal.	Pounds per Cu. Ft.	Cu. Ft. per Ton of 2240 lbs.	Gallons per Ton of 2240 lbs.	Barrels per Ton of 2240 lbs.
10	1.0000	8.328	349.78	62.298	35.96	268.97	6.40
11	.9929	8.269	347.30	61.856	36.21	270.89	6.45
12	.9859	8.211	344.86	61.422	36.47	272.81	6.49
13	.9790	8.153	342.43	60.989	36.73	274.75	6.54
14	.9722	8.096	340.03	60.562	36.99	276.68	6.59
15	.9655	8.041	337.72	60.151	37.24	278.57	6.63
16	.9589	7.986	335.41	59.739	37.50	280.49	6.68
17	.9524	7.931	333.10	59.328	37.75	282.44	6.72
18	.9459	7.877	330.83	58.924	38.01	284.37	6.77
19	.9396	7.825	328.65	58.535	38.27	286.26	6.82
20	.9333	7.772	326.42	58.138	38.52	288.21	6.86
21	.9272	7.721	324.28	57.757	38.78	290.19	6.91
22	.9211	7.670	322.14	57.375	39.04	292.05	6.95
23	.9150	7.62	320.04	57.001	39.30	293.96	6.99
24	.9091	7.57	317.94	56.627	39.56	295.91	7.04
25	.9032	7.522	315.92	56.268	39.82	297.79	7.09
26	.8974	7.473	313.87	55.902	40.07	299.77	7.13
27	.8917	7.425	311.85	55.543	40.33	301.68	7.18
28	.8861	7.378	309.88	55.191	40.58	303.61	7.23
29	.8805	7.332	307.94	54.847	40.84	305.51	7.27
30	.8750	7.286	306.01	54.503	41.10	307.44	7.32
35	.8485	7.065	296.73	52.850	42.38	317.06	7.55
40	.8235	6.857	287.99	51.294	43.67	326.67	7.77

Formula $\dfrac{140}{130 + {}^\circ\text{Be.}} = \text{Sp. Gr.}$ 7.4805 Gal. = 1 Cu. Ft.

Temperature corrections:

For each 18° above 60° F. add 1° Be.
For each 18° below 60° F. subtract 1° Be.

ANALYSIS AND CALORIFIC VALUE OF OILS

(*C. E. Lucke*)

	Density at 60° or 90° F.		Ultimate Analysis				Heating Value B. T. U. per lb.	
	Sp. Gravity	Baume	C %	H %	O&N %	S %	High	Low
California Fuel	.966	14.93	81.52	11.61	6.92	.55	18926	17903
Texas, Beaumont Fuel	.926	21.25	83.26	12.41	3.83	.50	19654	18570
California Crude	.957	16.24	86.30	16.70		.80	21723	21254
Texas, Beaumont Crude	.924	21.56	84.60	10.90	2.87	1.63	18977	18025
Pennsylvania Crude	.914	23.18	86.10	13.90		.06	20949	19735
Kansas Crude	.866	31.67	85.40	13.07			20345	19203
West Virginia Crude	.841	36.47	84.30	14.10	1.6		20809	19578
Ohio Crude	.829	38.89	85.00	13.80	.6	.6	20752	19547
Mexico	.921	21.90	83.70	10.20		4.15	18840	17800
Russia	.938	19.30	86.60	12.30	1.10		20138	18990

	Average Sp. Gravity	Average B. T. U. per lbs.
Crude Oil................	.82 to .97	17500—21000
Kerosene................	.863	18700
Gasoline.................	.710	18500

Relation of Baumé Readings to Density and Volume

(Bureau of Mines)

Baumé	Spec. Gravity 60° F.	Lb. per Gallon	Gallon per Lb.
10.0	1.0000	8.328	0.1201
15.0	.9655	8.041	.1244
20.0	.9333	7.772	.1287
25.0	.9032	7.522	.1330
30.0	.8750	7.286	.1370
35.0	.8485	7.065	.1415
40.0	.8235	6.857	.1459

Corresponding Specific Gravities to the Baumé Scale—*Smithsonian Tables*

	Specific Gravity	DEGREES BAUME 0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
Less than 1	0.60	103.33	99.51	95.81	92.22	88.75	85.38	82.12	78.95	75.88	72.90
	0.70	70.00	67.18	64.44	61.78	59.19	56.67	54.21	51.82	49.49	47.22
	0.80	45.00	42.84	40.73	38.68	36.67	34.71	32.79	30.92	29.09	27.30
	0.90	25.56	23.85	22.17	20.54	18.94	17.37	15.83	14.33	12.86	11.41
	1.00	10.00									
Greater than Unity	1.00	0.00	1.44	2.84	4.22	5.58	6.91	8.21	9.49	10.74	11.97
	1.10	13.18	14.37	15.54	16.68	17.81	18.91	20.00	21.07	22.12	23.15
	1.20	24.17	25.16	26.15	27.11	28.06	29.00	29.92	30.83	31.72	32.60
	1.30	33.46	34.31	35.15	35.98	36.79	37.59	38.38	39.16	39.93	40.68
	1.40	41.43	42.16	42.89	43.60	44.31	45.00	45.68	46.36	47.03	47.68
	1.50	48.33	48.97	49.60	50.23	50.84	51.45	52.05	52.64	53.23	53.80
	1.60	54.38	54.94	55.49	56.04	56.58	57.12	57.65	58.17	58.69	59.20
	1.70	59.71	60.20	60.70	61.18	61.67	62.14	62.61	63.08	63.54	63.99
	1.80	64.44	64.89	65.33	65.76	66.20	66.62	....	....	....	....

Specific Gravities Corresponding to the Baume Scale
These specific gravities are for 15.56°C (60°F) referred to water at the same temperature as unity.
For values less than unity the values are calculated from the formula:

$$\text{Degrees Baumé} = \left(\frac{140}{\text{Spec. Gravity}}\right) - 130$$

For values greater than unity from the formula:

$$\text{Degrees Baumé} = 145 - \left(\frac{145}{\text{Spec. Gravity}}\right)$$

Gaseous Fuels

Boilers fired with natural or artificial gas possess all the advantages of oil-burning installations, as to cleanliness, ease of control and minimum labor charge.

Natural gas, like mineral oil, is formed from organic matter, and is chiefly a mixture of hydrocarbons, and rather simple in its composition, as there are few hydrocarbons which are gaseous at ordinary temperatures. It consists almost entirely of methane or marsh gas, CH_4, with traces of CO, CO_2, oxygen and nitrogen. Some natural gases contain higher hydrocarbons, such as ethylene, C_2H_4, which give illuminating value or which can be condensed by compression and removed. Consisting almost entirely of carbon and hydrogen, the natural gases have considerable heating value, even when figured on the so-called "low" basis, where the latent heat of vaporization of the water produced is deducted. This deduction is made necessary by the fact that this heat does not affect the temperature of the flue gases, and does not become available till they are cooled below 212° F., which is done in the calorimeter test, but does not occur in boiler practice. The average low calorific value is 21,000 BTU per lb. of gas.

Coke oven gas contains over 80% of hydrogen and hydrocarbons distilled off from the coked coal, and has a heating value (low) of 14,000 BTU per lb.

Blast furnace and producer gases contain around 60% atmospheric nitrogen, with large quantities of CO and CO_2. The CO resulting from the primary combustion of the coke in the hearth of the blast furnace is partly oxidized to CO_2 by the descending ore, but sufficient CO remains in the gas for it to give a heating value of over 1200 BTU per lb., and to be available, when properly cleared and dried, for combustion in pre-heating stoves or under boilers.

The calorific value of a gas can be more readily predicted than that of coals and oils, since each of its constituents has a known calorific power. The calorific value per unit volume is the sum of the proportions by volume of each of the constituents multiplied by their calorific powers per unit volume. There will be both a high and a low calorific value, owing to the presence of hydrogen. The accompanying table shows the compositions and calorific values of representative natural, blast furnace, producer, and by-product coke gases.

Typical Volumeric Analyses and Combination Characteristics of Fuel Gases

(*C. E. Lucke*)

	Sp. Wt. At 32°F.	Sp. Vol. 29.92″ Hg.	Theoretical Air for Combustion.		Low Heating Value.	
	lb. per cu. Ft.	Cu. Ft. per lb.	Cu. Ft. per cu. ft.	lb. per per lb.	B. T. U. per lb.	B. T. U. per cu. ft.
Carbon Monoxide Co	.07807	12.8090	2.39	2.470	4369	341
Hydrogen H_2	.00562	177.9093	2.39	34.320	51892	292
Methane CH_4	.04470	22.3490	9.56	17.244	21463	959
Ethylene C_2H_4	.07951	12.5780	14.34	14.577	20053	1595
Benzene C_2H_6	.21930	4.5600	35.85	13.194	17305	3795
Natural Gas (Kansas)	.04460	22.4200	9.397	17.004	21301	950
Coke Oven Gas	.04031	24.8070	5.43	10.872	14384	580
Blast Furnace Gas	.08049	12.4249	.729	.731	1274	103
Anthracite Producer	.06954	14.3810	.999	1.159	1929	134
Bituminous Producer	.07902	12.6540	.937	1.059	1397	110

	CO	H_2	CH_4	C_2H_4	C_6H_6	O_2	CO_2	N_2	Low Htg. Value B. T. U. Per lb.	B. T. U. Per Cu. Ft.
Natural Gas (Kansas)	.25		98.2		.1	.25			21301	950
Coke Oven Gas	6.0	42.0	34.3	2.0	2.0	1.1	2.5	10.1	14384	580
Blast Furnace Gas	27.5	3.0					10.0	59.5	1274	103
Anthracite Producer	25.7	15.3	.2			.40	5.5	52.9	1929	134
Bituminous Producer	14.34	2.81	5.56			.10	10.5	66.7	1397	110

NOTES ON CHIMNEY FLUES

The importance of the chimney in any installation cannot be over emphasized. The control which a chimney maintains over the operation of a boiler is absolutely positive; and the fact is of vital consequence. In any given installation, satisfactory service can be expected only if chimney conditions are right.

The reason for this is very simple. It is a fundamental fact that combustion cannot take place without a supply of air (oxygen). In order to provide an adequate supply of air to any boiler there must be a sufficient draft. And for this, the chimney is entirely responsible.

The chimney acts like an exhaust fan. The hot gases of combustion which fill it are lighter in weight than an equal column of air outside, and are therefore drawn upward through the chimney as though they were sucked up by a fan. Fresh air is automatically drawn into the boiler and through the bed of fuel. In this way combustion is sustained, its rate depending of course upon the amount of draft. But should the chimney be improperly constructed, or of inadequate size, an insufficient draft will be supplied to the boiler and successful results cannot be expected. From this fundamental principle of chimney action many chimney failures can be explained.

The following are the most important rules to be remembered in connection with chimneys:

The chimney-top should run above the highest part of the roof and should not be less in height than shown in table.

The chimney should be so located with reference to higher buildings nearby that wind-currents will not form eddies and force the air downward in the shaft. A shifting cowl, which will always turn the outlet away from the adverse currents, will promote better draft.

The flue should run as nearly straight as possible from the base to the top outlet. The outlet must not be capped so that its area is less than the area of the flue. The flue should have no other openings into it but the boiler smoke pipe. Sharp bends and offsets in the flue will often reduce the area and choke the draft. The flue must be free of any feature which prevents full area for the passage of smoke, etc.

If the flue is made of tile the joints must be well cemented, or all space between the tile and brick-work filled in tightly. There must be no open crevices into the flue where the sections meet—otherwise the draft is checked.

If the flue is made of brick, the stack should have outside walls at least eight inches thick to insure safety. The inside joints should be well struck; each course should be well bedded and free from surplus mortar at the joints.

If there is a soot-pocket in the flue below the smoke pipe opening, the clean-out door should always be tightly closed. If this soot-pocket has other openings in it—from fire-places or other connections—these openings check the draft and prevent best heating results from the Boiler.

The smoke pipe should not extend into the flue beyond the inside surface of the flue, otherwise the end of the pipe cuts down the area of the flue.

The joints, where the smoke pipe fits the smoke-hood of the boiler, or where the pipe enters the chimney, should be made tight with boiler putty or asbestos cement.

CONSTRUCTION OF CHIMNEYS

Recommended by the

National Board of Fire Underwriters'
Committee on Construction of Buildings

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AN ORDINANCE

Suitable for Use in Cities and Towns of Any Size or as a State Law, Providing Minimum Requirements for Proper and Safe Construction of Chimneys, Flues and Fireplaces.

FOREWORD

THE average annual loss due to defective chimneys in the United States for the years 1916-19, inclusive, and reported by the Actuarial Bureau to the National Board of Fire Underwriters was $11,898,000. All losses were not reported and it is conservatively estimated that the complete actual loss was 25 per cent. larger, thus making an approximate total loss per year of $14,872,000. The number of lives sacrificed in the average 23,000 fires which produced this annual property loss is not known —but is unquestionably large.

Since fires from this cause are classed as "strictly preventable," it should need no further argument to justify the promulgation of this Ordinance, which is suitable for adoption by a town of any size, or for enactment as a state law. The latter form would be the most effective.

Conservation of our national resources is the demand of the hour. It is, therefore, the duty of all state and municipal authorities to use their best endeavors to stop this great needless waste.

The enforcement of a law requiring safe, smoke-tight construction of chimneys of ample size and height would be a sure means of accomplishing an immense saving in life and property as well as materially increasing home comforts.

Defective chimney fires would practically disappear if this Ordinance were generally enforced, and since the additional cost of the construction herein recommended as compared with ordinary practice would seldom exceed $10 to $15 per chimney, the requirement would not be burdensome. The increased expense would be returned many fold due to saving of life and property and the efficient use of fuel.

The following organizations have reviewed this Ordinance and approved it as here presented.

American Institute of Architects,
American Society of Heating and Ventilating Engineers,
Associated Tile Manufacturers,
Clay Products Association,
Common Brick Manufacturers Association,
Eastern Clay Products Association,
National Boiler and Radiator Manufacturers Association,
National Fire Protection Association,
National Brick Manufacturers Association,
National Lime Association—Eastern Bureau.
National Lumber Manufacturer's Association,
National Warm Air Heating and Ventilating Association,

Also various independent Architects and Heating Engineers having wide experience in the subject.

This broad endorsement gives the requirements a reputation for correctness which has not

been accorded to any similar set of specifications hitherto prepared. It is, therefore, hoped the Ordinance may receive generous public approval, and become a construction standard in states, cities and towns throughout the country.

Scope of the Ordinance.

This Ordinance does not apply to chimneys for high pressure boilers, furnaces used in manufacture, or for other heating appliances where high temperatures are maintained; but shall apply to all other chimneys which form a part of a building construction.

Section I. Chimney Construction.

1. The walls of all chimneys to which this Ordinance applies, whether the fuel used be wood, coal, gas or oil, shall be built of brick, concrete, stone, or hollow tile, of such thickness and construction as is hereafter specified, but this shall not preclude the use of a metal smoke-stack when located inside of a vent shaft having walls not less than 8 inches thick, and having an air space between the walls and stack on all sides.

2. Brick chimneys shall be built of solid brick, or may be built of perforated radial brick manufactured for the purpose and adapted to withstand high temperatures, but no other hollow brick shall be used.

3. The walls of brick chimneys shall be not less than 3¾ inches thick (width of a standard size brick), and shall be lined with fire clay flue lining.

4. Flue lining may be omitted in brick chimneys for private dwellings provided the walls of the chimneys are not less than 8 inches thick, and that the inner course shall be a refractory clay brick having a softening point of at least 1922 degrees Fahrenheit (Seger Cone 05). See Appendix I and II.

5. Perforated radial brick chimneys may be unlined, provided the brick shall have a softening point of not less than 1994 degrees Fahrenheit (Seger Cone 03), and shall be not less than 7½ inches in radial thickness, except that when such chimney is located inside a vent shaft having walls not less than 8 inches thick, the thickness of the chimney wall may be determined by engineering design. The brick shall be shaped to the circular and radial lines of the various sections of the shaft so as to form even joints.

6. All brick work shall be laid in spread mortar, with all joints push-filled. Exposed joints both inside and outside shall be struck smooth. No plaster lining permitted.

7. Concrete chimneys cast in place shall be suitably reinforced vertically and horizontally. The walls shall be not less than 3¾ inches thick and shall be lined with fire clay flue lining.

Flue linings may be omitted in reinforced concrete chimneys for private dwellings, provided the walls of the chimneys be not less than 6 inches thick, and provided further that quartz gravel shall not be used as the coarse aggregate. See Appendix III.

8. Concrete blocks used in chimney construction shall have walls not less than 3¾ inches thick, and blocks enclosing more than one flue shall have suitable reinforcement completely encircling the blocks and well embedded in them. All concrete block chimneys shall have fire clay flue lining. See Appendix III.

9. Stone chimneys shall be at least 4 inches thicker than required for corresponding brick chimneys, and shall have fire clay flue linings. Rubble stone chimney walls shall be not less than 12 inches thick.

10. Hollow building tile shall not be used for the walls of isolated or independent chimneys, but may be used for chimneys built in connection with exterior hollow tile walls of buildings not exceeding three stories in height, in which case the chimney walls shall be not less than 8 inches thick. The outer 8 inches of a building wall may serve as the outside wall of the chimney, but the remaining chimney walls shall be constructed of two layers of 4-inch tile set with broken joints; or they may be built of 4 inches of solid brickwork. In either case the walls of the chimney shall be securely bonded into the wall of the building. No chimney shall be corbeled from a hollow tile wall. All chimneys built of hollow building tile shall have fire clay flue lining. See Appendix IV.

11. Chimneys shall be built at least 3 feet above flat roofs, and 2 feet above the ridges of

peak roofs, and shall be properly capped with stone, terra cotta, concrete, cast iron, or other approved material; but no such cap or coping shall decrease the required flue area. See Plates I and II.

12. Fire clay flue linings shall be manufactured from suitable refractory clay, either natural or compounded, which has a softening point not lower than 1994 degrees Fahrenheit (Seger Cone 03), and shall be adapted to withstand high temperatures and flue gases. They shall be of standard commercial thickness, but not less than ¾ inch. The flue sections shall be set in mortar of quality hereafter specified and shall have the joints struck smooth on the inside. The masonry shall be built around each section of lining as it is placed, and all spaces between masonry and linings shall be completely filled with mortar. No broken flue lining shall be used. Flue linings shall start at least 4 inches below the bottom of smokepipe intakes of flues, or from the throats of fireplaces, and shall be continuous the entire heights of the flues and project at least 4 inches above the chimney top to allow for a 2 inch wash and a 2 inch projection of lining. The wash or splay shall be formed of a rich cement mortar. To improve the draft the wash surface should be concave wherever practical. Instead of the wash, a special chimney cap or coping may be used. Wherever flue linings are specified fine brick may be substituted if desired.

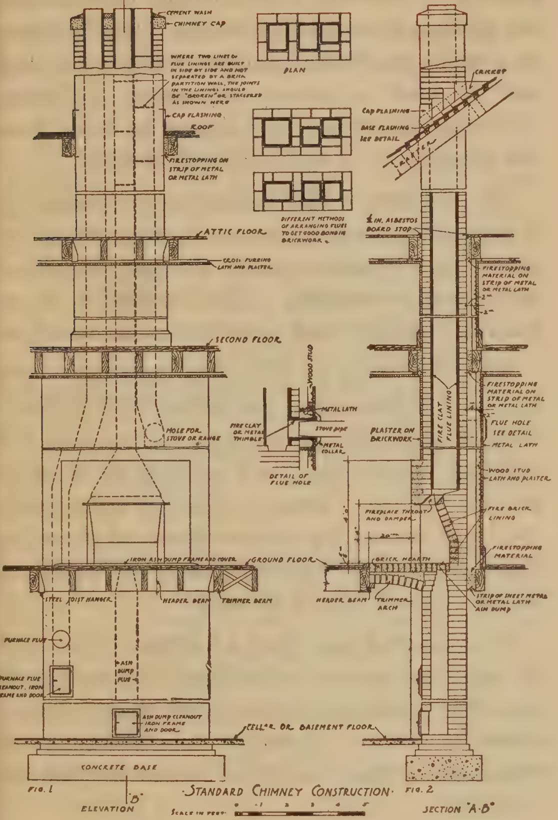


PLATE I.

Elevation and section of an interior independent chimney showing recommended construction. Extra flues can be added as desired.

13. Chimneys shall not rest upon or be carried by wooden floors, beams or brackets, nor be hung from wooden rafters. Iron brackets or stirrups attached to wooden construction shall not be used to support chimneys. In frame buildings chimneys shall always be built from the ground up, or rest on basement walls.

14. Chimneys shall be built upon concrete or masonry foundations properly proportioned to carry the weight imposed without danger of settlement or cracking. The foundation for an exterior chimney shall start below the frost line.

15. The walls of brick buildings may form part of a chimney, but the walls of the chimney shall be securely bonded into the walls of the building, and the flue shall be lined the same as an independent chimney. Flues in party walls shall not extend beyond the center of the walls, and their location shall be permanently indicated on the exposed side of the wall.

16. No wall less than 12 inches thick shall be used to support a corbeled chimney; such corbeling shall not project more than 6 inches from the face of the wall, and in all such cases the corbeling shall consist of at least five courses of brick.

17. Flues shall be built as nearly vertical as possible, but in no case shall they have an angle greater than 45 degrees from the vertical.

Where flues change direction, the abutting linings at the angle joints shall be chipped to fit closely, and at no point shall the cross section area be reduced. There shall be but one connection to a flue.

18. Not more than two flues shall be permitted in the same flue space, and the joints of any two adjoining sets of flue linings shall be offset at least 7 inches. When there are more than two flues in a chimney, at least each third flue shall be separated from the others by a smoke-tight withe or division wall of brick or concrete at least 3¾ inches thick and bonded into the side walls. Each flue intended for a heating furnace or boiler connection, or for a fireplace, shall be separated from other flues by such a withe. In hollow tile chimneys the withe may be of tile. See Appendix V.

19. When any single flue area within chimney walls exceed 200 square inches, the walls shall be built not less than 8 inches thick and shall have fire clay flue lining as previously specified, but when flues become so large as to render it impractical to secure fire clay flue lining, they shall be lined with fire brick for a distance of at least 25 feet from the point of intake. Fire brick shall be laid in fire clay mortar.

20. Connections between chimneys and roofs shall be made with sheet metal counter or cap flashing (copper recommended), arranged to

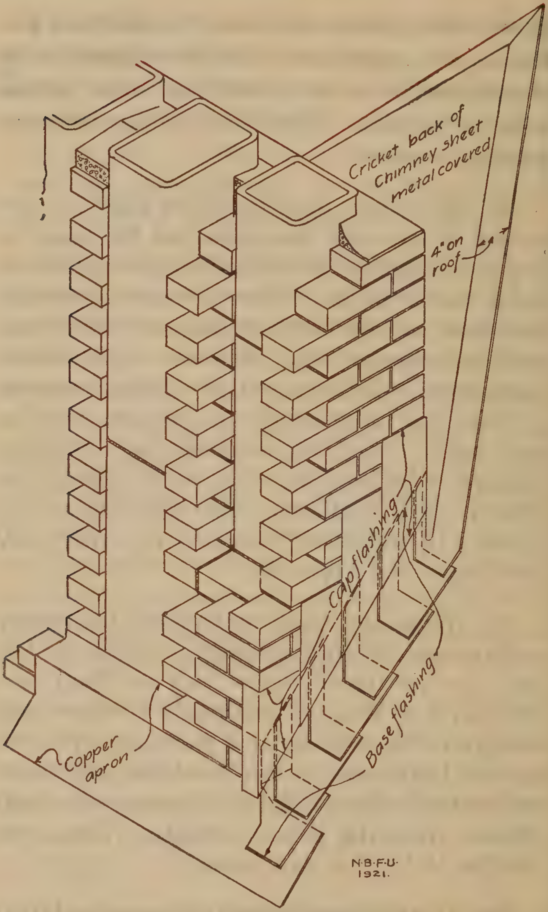


PLATE II.

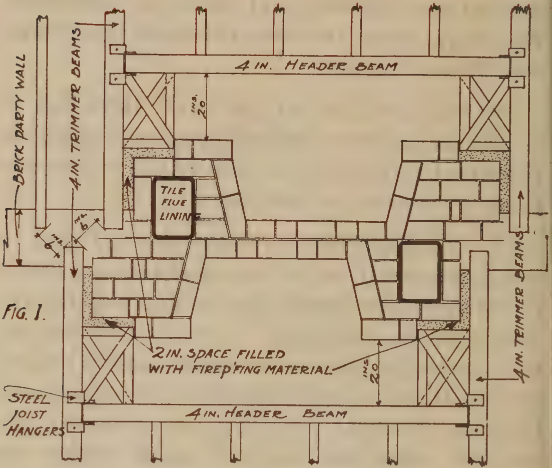
Details of chimney construction showing method of flashing at roof surface also a wash course, but no cap surrounding flues at top. See Plate I.

overlap roof flashing and allow for movement that may occur between chimneys and roofs. See Plates I and II.

21. No increase in the wall thickness of chimneys, nor any projecting masonry, shall be permitted within a distance of 12 inches above or below the rafters or roof joists.

22. Irrespective of whether the fuel used be coal, coke, wood, or oil, the minimum area inside of chimney flue linings for various heating devices shall be as follows: For warm air furnaces, or low pressure steam or hot water heating boilers, not less than 75 square inches; for fireplaces, not less than one-tenth the area of the fireplace opening, but never less than 75 square inches; for stoves, ranges, and other forms of room heaters, 49 square inches for rectangular flues, or an inside diameter of 7 inches for round flues. In no case shall the short cross section dimension of a rectangular flue be less than two-thirds the greater dimension. See Appendix VI.

When gas is the fuel used in a heating furnace, boiler, or automatic hot water heater, the flues shall be of the same size and construction as required for stoves and ranges using other fuel. Vent flues where required for other domestic gas burning appliances may be of smaller size, but not less than 10 square inches. Such flues shall be made of fire clay or its equivalent not less than 1 inch thick with joints properly designed to effect a permanent seal, and the surrounding



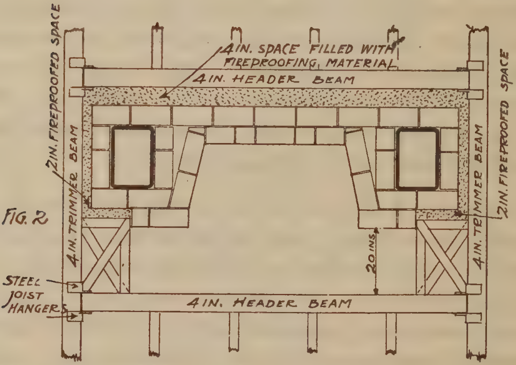


PLATE III.

Fig. 1.—Method for building two fireplaces back-to-back in a brick party wall to secure proper spacing between ends of floor joists.

Fig. 2.—Floor framing around a single fireplace. Note filling between framing and brickwork, which serves both as insulator and fire-stop.

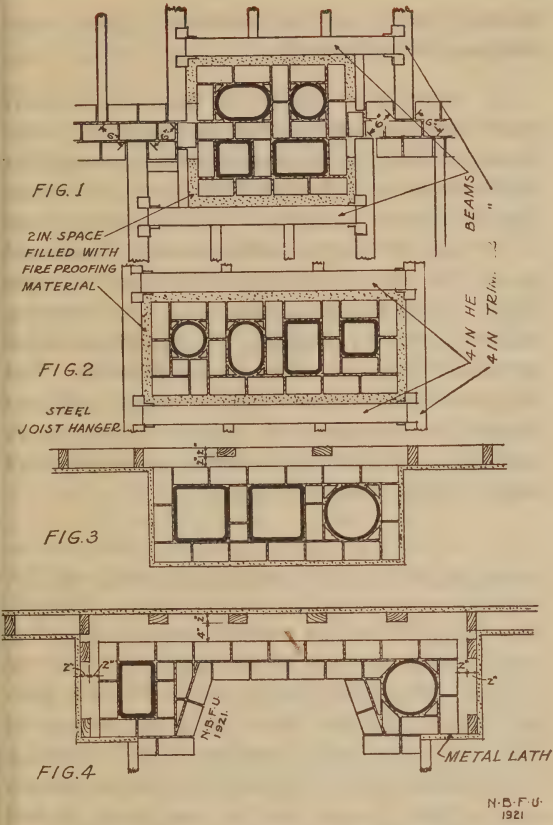


PLATE IV.

Fig. 1—Floor framing around chimney in a party wall, to secure proper space between ends of floor joists.

Fig. 2.—Ordinary floor framing around a chimney. All timbers 2 inches clear of brickwork and space filled with fireproofing material.

Fig. 3.—Stud partition across back of a chimney showing proper method of arranging studs.

Fig. 4.—Stud partition across back of a fire-place and around the ends of the chimney breast, showing proper arrangement of studs. Method of fire-stopping this space is shown on chimney section, Plate I, also in Fig. 2, Plate III

masonry walls may be omitted. Metal vent flues are not permitted.

23. Smokepipe intakes to flues shall always enter the chimney through the side and shall consist of fire clay or metal thimbles securely set in the chimney wall with mortar, or the intake may be cast in concrete. Such openings shall be at least 18 inches below wooden lath and plaster or other combustible ceilings, or open joists. Neither the intake pipe nor thimble shall project into the flue. No woodwork shall be placed within 6 inches of the thimble. The thimble shall be surrounded by metal lath and plaster for a space of at least 6 inches, or an open space of that width shall be provided on all sides. See detail sketch Plate 1.

24. All mortar used in chimney construction, except as specified for fire brick in paragraph 19, shall be cement mortar proportioned as follows: Two bags of Portland cement, not less than 188 pounds, and one bag of dry hydrated lime, 50 pounds, thoroughly mixed dry. To this mixture shall be added three times its volume of clean, sharp sand with sufficient water to produce proper consistency. When dry hydrated lime is not available, 1 cubic foot of completely slaked lime putty may be substituted for 50 pounds of dry hydrate. In case of such substitution, the mixing of lime and cement shall be very thorough. Dry hydrate should always be used in preference to lime putty.

25. After a chimney has been completed, all flues shall be thoroughly cleaned and left smooth on the inside.

26. All flues to which heating furnaces or boilers are to be connected shall be subjected to a smoke test before acceptance, but the test shall not be made until the mortar has thoroughly hardened. The method of test is to build a smudge fire at bottom of the flue and while the smoke is flowing freely from the flue, close it tightly at the top. Escape of smoke into other flues or through the chimney walls indicates openings that shall be made tight before the chimney is accepted. The test shall be made by the contractor in the presence of the Building Inspector or other official having jurisdiction, and of the owner or his representative.

Section II. Woodwork Around Chimneys.

1. No wooden beams, joists, or rafters shall be placed within 2 inches of the outside face of chimneys, whether the same be for smoke, air or any other purpose. No woodwork shall be placed within 4 inches of the back wall of any fireplace. See Plate III, Fig. 2, and Plate IV, Fig. 4.

2. All spaces between chimneys and wooden joists or beams shall be filled with loose cinders, loose mortar refuse, gypsum block, or other porous incombustible material to form a fire-stop. See Plates I, III and IV.

The incombustible material shall be supported by strips of sheet metal or metal lath set into

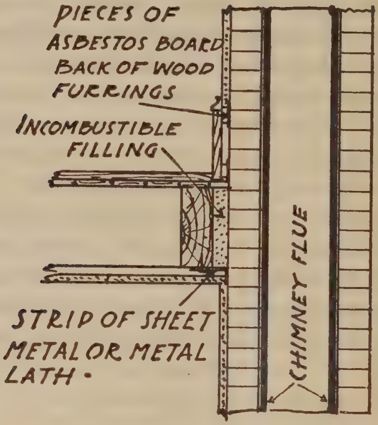


PLATE V.

Detail showing support for fire-stopping around chimney, and protection for woodwork placed next to plaster on chimney brickwork.

the brickwork and nailed to the wooden beams, forming a buckled flexible joint between, as indicated in Plate I; or by similar strips of metal nailed to the woodwork with the inner edge close to the chimney. See Plate V.

3. No wooden studding, furring, lathing, or plugging shall be placed against any chimney, or in the joints thereof. Wooden construction shall either be set away from the chimneys, or the plastering shall be directly on the masonry or on

metal lathing or on incombustible furring material. Wood furring strips placed around chimneys to support base or other trim shall be insulated from the masonry by asbestos paper, at least ⅛-inch thick, and metal wall plugs or approved incombustible nail holding devices attached to the wall surface shall be used for nailing. See Plate V.

4. The walls of fireplaces shall never be less than 8 inches thick, and if built of stone the minimum thickness shall be 12 inches.

5. All fireplaces and chimney breasts shall have trimmer arches or other approved fire-resistive construction supporting hearths. The arches and hearths shall be at least 20 inches wide measured from the face of the chimney breast. The arches shall be of brick, stone or hollow tile, not less than 4 inches thick. A flat stone or a reinforced concrete slab may be used to carry the hearth instead of an arch if it be properly supported and a suitable fill be provided between it and the hearth. The length of trimmer arches and hearths shall be not less than 24 inches longer than the fireplace opening. Hearths shall be of brick, stone, tile, or concrete as may be specified. Wood centering under a trimmer arch shall be removed before plastering the ceilings beneath.

6. No coal burning heater shall be placed in a fireplace which does not conform to the fore-

going requirements and have an incombustible mantel.

7. No wooden mantel or other woodwork shall be placed within 8 inches of the side or within 12 inches of the top of any open fireplace. No combustible summer piece or fire board shall be used.

8. Any person or persons, whether owner, builder or mechanic, who shall build a chimney or flue in violation of any requirements of this Ordinance shall be deemed guilty of a misdemeanor and shall be fined not less than $10 nor more than $......... for each offense; and any chimney or flue which is built in violation of any requirement of this Ordinance shall be immediately demolished or rebuilt. It shall be the duty of the Building Inspector or other duly authorized official to enforce this Ordinance.

9. All ordinances or parts of ordinances in conflict with this Ordinance are hereby repealed.

10. This Ordinance shall take effect upon being approved by the......................

Standard Dimensions of Round Fire Clay Flue Linings

Inside Diameter of Flue Linings, Inches	Inside Cross Sectional Area of Flue Linings, Sq. Ins.	Thickness of Shell, Inches	Outside Diameter of Flue Linings, Inches	Outside Cross Sectional Area of Flue Linings, Sq. Ins.	Cross Sectional Area of Shell Sq. Ins.	Length, Feet
6	28.27	⅝	7¼	41.28	13.01	2
8	50.26	¾	9½	70.88	20.62	2
10	78.54	⅞	11¾	108.4	29.86	2
12	113.0	1	13	132.7	19.7	2
15	176.7	1⅛	17¼	233.7	57	2
18	254.4	1¼	20½	330.0	75.6	2
20	314.1	1⅜	22¾	406.4	92.3	2
22	380.13	1⅝	25⅛	495.7	115.57	2
24	452.3	1⅝	27¼	583.2	130.9	2
27	572.5	2	31	754.8	182.3	2½
30	706.8	2⅛	34¼	921.3	214.5	2½
33	855.3	2¼	37½	1104.5	249.2	2½
36	1017.9	2½	41.0	1320.3	302.4	2½

Standard Dimensions of Rectangular Fire Clay Flue Linings

No Allowance for Radial Corners

Inside Dimensions of Flue Linings, Inches	Inside Cross Sectional Area of Flue Linings, Sq. Ins.	Thickness of Shell, Inches	Outside Dimensions of Flue Linings, Inches	Outside Cross Sectional Area of Flue Linings, Sq. Ins.	Cross Sectional Area of Shell, Sq. Ins.	Length Feet
3¼x 7¼	23.56	⅝	4½x 8½	38.25	14.69	2
3¼x11¾	38.19	⅝	4½x13	58.5	20.31	2
6¼x 6¼	39.06	⅝	7½x 7½	56.25	17.19	2
7¼x 7¼	52.56	⅝	8½x 8½	72.25	19.69	2
7 x11½	80.5	¾	8½x13	110.5	30.0	2
6¾x16¼	109.69	⅞	8½x18	153.0	43.31	2
11¼x11¼	126.56	⅞	13 x13	169.0	42.44	2
11¼x16¼	182.84	⅞	13 x18	234.0	51.16	2
15¾x15¾	248.06	1⅛	18 x18	324.0	75.94	2
17¼x17¼	297.56	1⅜	20 x20	400.0	102.44	2
17 x21	357.0	1½	20 x24	480.0	123.0	2
21 x21	441.0	1½	24 x24	576.0	135.0	2

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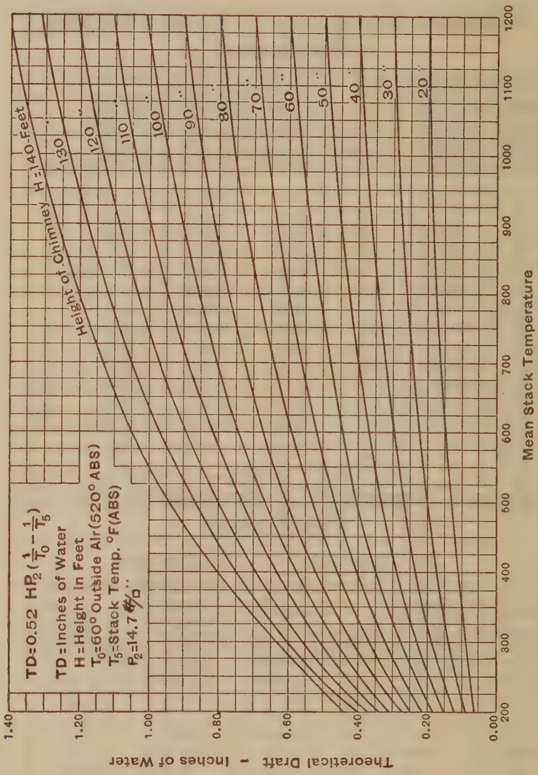
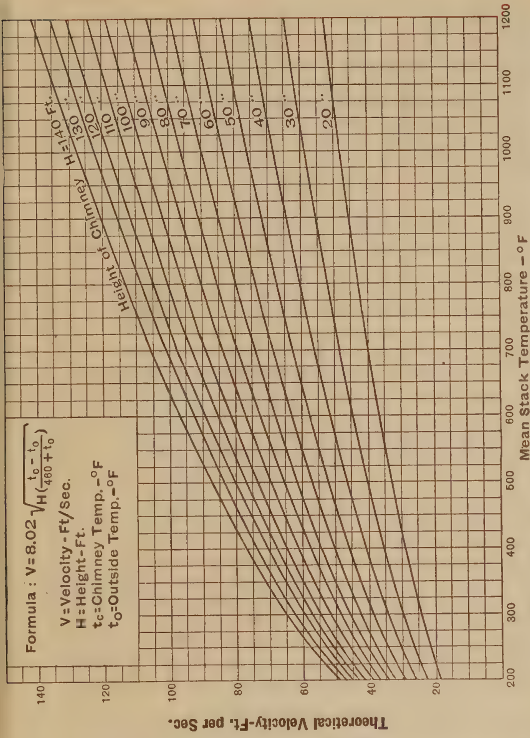


THEORETICAL DRAFT AT VARIOUS HEIGHTS AND TEMPERATURES

From this chart the theoretical draft in inches of water can be obtained when the mean stack temperatures and height of chimney are known.

For example: Mean stack temperature 600° F. chimney height 100 ft. The intersection of the vertical line showing 600° F mean stack temperature with curve showing chimney height 100 feet gives the theoretical draft of .75″ of water which is read on left hand side of chart. The theoretical draft is always greater than that actually found in practice, the difference being due to the pressure necessary to force the gases through the stack against their own inertia and the friction against the side of the chimney.



THEORETICAL VELOCITIES AT VARIOUS HEIGHTS AND TEMPERATURES

From this chart the theoretical velocity in feet per second of gases in chimney for various heights and temperatures can be obtained.

Example: Given the mean stack temperature of 600°F, and stack height 100 feet. The intersection of the vertical line showing 600°F mean stack temperature with curve showing chimney height 100 ft., gives the theoretical velocity of approximately 82 ft. per second, which is read on left hand side of chart.

In practise the theoretical velocity is never obtained due to friction and other causes. The actual velocity will vary from 25 to 50 percent of the theoretical depending on size of chimney and nature of interior surface.

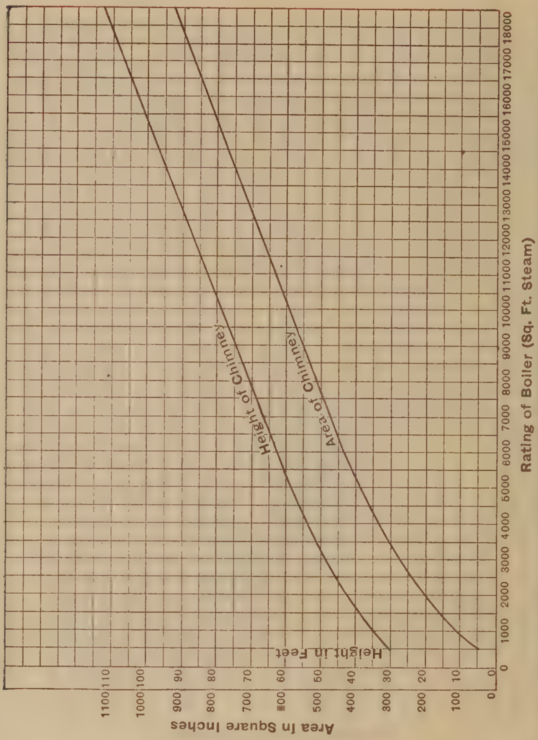


CHART SHOWING RELATION OF CHIMNEY DIMENSIONS TO BOILER RATING

From this chart chimney areas and heights can be obtained for boilers of various ratings.

Example: To find chimney area and height required for 9000 sq. ft. steam boiler. Read along vertical line of 9000 sq. ft. steam rating to intersection of curve for chimney area and chimney height-and read at left hand side of page, area 550 sq. ins. and height 75 ft.

MEASURING BOILER DEMANDS

In estimating the size of the Boiler required, the square feet of surface on all mains and risers used on the job should be considered in connection with the radiators to be installed. This additional surface should be carefully computed and considered with reference to the amount of steam it condenses, or its cooling effect on water.

If radiation other than the direct form is used, the Boiler capacity must be increased in proportion as those surfaces may condense steam or cool the water more rapidly than direct radiation.

It has been the common practise to assume that the extra tax imposed on a boiler, due to piping installed, is about 25% of the amount of column radiation. While this percentage will in some instances fairly represent the tax imposed, it does not apply to all cases.

The proportionate amount of piping to direct column radiation is greater in a small installation than in a large installation. On a percentage basis, the additional load imposed on the boiler by the amount of piping necessary in a small installation will be from 40% to 50% of the amount of column radiation installed, whereas on larger jobs the percentage will be from 30% to 35% and will decrease proportionately to about 25% for jobs with 4,000 square feet or over of steam, and 6,500 square feet or over of hot water column radiation.

Take for example, a case calling for one of our Ideal Steam Boilers. Their capacities are rated on the basis of 2 pounds gauge pressure (219 degrees Fahrenheit) at the boiler and 1 pound of steam condensed per hour to each 4 feet of condensing surface standing in air at 70 degrees.

Ideal Water Boilers are rated with water at a temperature of 180 degrees F. leaving the Boiler and radiation standing in air at 70 degrees. Like all heating boilers their ratings are figured in terms of direct radiation.

As Ideal Steam Boilers are rated on so definite a standard it only requires a knowledge of how many pounds of steam will be required per hour to select accurately a Boiler which cannot fail to produce the heating effect required, with proper conditions of fuel and draft. For example, suppose a steam heating job presents the following demands:

	Radiation and Piping at Surface Measurements	Multiplier to Convert to Equivalent Column Radiation	Equivalent Column Radiation Square Feet
Direct radiation standing in air at 70 degrees	2,600	1.0	2,600
Indirect radiation	1,300	1.7	2,210
Mains, branches and risers standing in air at 60 degrees	800	1.5	1,200
Total square feet of radiating surface	4,700		
Total equivalent column radiation			6,010

By this it will be seen that while there is a total of 4,700 square feet of radiating surface—of which 800 square feet is piping surface—exposed to air at varying degrees of temperature, yet because of the increased condensing effect to which portions of the surface are subjected, the demand for steam is so increased that for the example cited the actual demand on the boiler would be equal to 6,010 square feet of radiation under standard conditions, not allowing for other conditions of load, such as morning peak load.

To provide for this extra tax, a boiler should be selected with a rated capacity of from 15 to 20 per cent greater than the actual connected load, as expressed in terms of equivalent Column radiation which would give us a boiler rated at 7,050 square feet (S-3612.) This illustrates the advantage of knowing the total surface the job presents in radiation and piping, and just how much steam is required to do the work. Selection is thus lifted from hazard or guesswork.

Note:—Indirect radiation—the rate of condensation depends upon temperature of air entering the stack, area, velocity, etc., and is here assumed for example to be 70% more than direct radiation.

Uncovered mains, branches and risers—the rate of condensation from these surfaces would be much diminished by a good pipe covering, depending upon the character of the material used.

A fair and dependable percentage of the Equivalent Column Radiation (Radiation only), plus Equivalent Column Radiation to take care of piping load and morning peak load in selecting Boiler capacity may be figured as follows: "Piping standing in air at 60 degrees."

Equivalent Column Radiation Load (Radiation only)	
100 to 300	feet plus 70 to 80%
300 to 450	feet plus 65 to 70%
450 to 700	feet plus 60 to 65%
700 to 1250	feet plus 55 to 60%
1250 to 4000	feet plus 50 to 55%
4000 to 10000	and over plus 50%

The foregoing percentages provide for the additional tax of piping plus the morning peak load.

Blowing Off Steam Boilers

After a steam or vapor boiler has been in operation for a short time, grease, oil, scale, and other foreign matter will accumulate in the boiler, which will invite various kinds of trouble and can only be eliminated by thorough cleaning.

The following method of blowing off is recommended

1. Close all radiator supply valves and when used remove the thermostatic member of all return line valves, or if boiler is valved close both supply and return. Blow down the boiler through bottom blowoff under a pressure of at least 5 lb. Where a blow off opening is tapped in boiler near water line connect a pipe with gate valve to blow off opening and blow oil and grease from boiler.

2. Remove the safety valve and put acid vinegar (Acetic acid) in the boiler as follows:

Boilers up to 1,000	sq. ft.,	capacity—	3 gallons
" " " 2,000	"	"	4 "
" " " 4,000	"	"	5 "
" " " 6,000	"	"	7 "

Replace the safety valve and operate the entire plant for one day.

3. Again remove the safety valve in the absence of a blow off opening and connect a pipe with gate valve to the outside on convenient drain. This pipe to be not less than size of safety valve. With water in boiler at proper level and valve in top blow-off pipe closed, build a very hot coal fire creating a pressure of 5 to 10 lbs. Open top blow-off valve and let water and steam pass through the blow-off line to drain—keep up a pressure between 5 and 10 lbs.—and carefully supply water constantly into boiler so as to keep gage glass filled to top—keep this up without interruption for 2 to 4 hrs. During the last hour fill boiler full of water allowing the hot water to flow through, and out of top blow-off pipe to drain.

4. Close the water-feed valve and let steam and water flow through top blow-off line until water level in boiler is at top of gage glass—close the gate valve in top blow-off line and with at least 10 lbs. steam pressure—draw fire quickly and open the bottom blow-off valve, and entirely drain the boiler. Allow the boiler to cool—replace if any thermostatic-members in return line valves—replace safety valve—close bottom blow-off valve and fill boiler with fresh water to proper level.

Sometimes one blowing off will not give the desired results in which case the operation must be repeated or continued until the boiler is thoroughly free from all foreign matter.

With plants using vacuum and boiler feed pump the return to pump should be closed off and all condensation passed to drain for at least a week and then the boiler should be cleaned as above.

To avoid all this expense and trouble, some heating contractors do not allow any return water from a new system to enter the boiler during the time temporary heat is on and while the men are working on the job. The valve on the return main is closed, a plug removed from a tee just outside the return valve and the feed-water valve cracked open enough to maintain the water in the boiler up to the water line under close watching by one of the steam fitters. At night the fire is banked, the plug in the return replaced and the return valve opened. With a banked fire practically no grease enters boiler from the system during night.

Grease in a boiler not only prevents proper steam generation but it is liable to cause damage to boiler. A practical method of determining when the water in a boiler is free from oil, is to draw a sample of the water from the gage cock into a vessel, say about 3 in. in diameter, and at least 8 to 12 in. deep. Have about 2 or 3 in. of water in the vessel and boil it over a gas plate or other hot fire. If there is oil in the water the boiling will cause it to foam and overflow the vessel; while if the water is clear and free from oil and alkali, one can always see the top of the boiling water emitting bubbles of steam but not foaming.

How to clean Water Gage Glass on Steam Boiler without removing it

1. Pour at least a tablespoon of raw muriatic or other acid into a cupful of hot water drawn from the boiler.
2. Close both water-gage valves.
3. Open top water-gage valve and also pet cock at bottom, and blow water out of glass. Then immediately close the top valve and submerge end of pet cock in cup of hot-water solution. A vacuum is at once created in gage glass which causes solution in the cup to rush in.
4. Keep the pet cock immersed and operate the top valve, slightly opening and closing, alternately expelling and drawing in the solution until all grease, oil, or other matter adhering to the inside of the glass is cut out. Then close pet cock and open both water-gage valves.

It is necessary to have 1 lb. pressure of steam or more on the boiler before commencing this operation, which need not occupy more than 10 minutes. The result is a clean glass without the risk of breakage and probable renewal of gaskets which is frequently the case when removing the glass for cleaning.

How to Determine the Water-Heating or Tank Capacities of any IDEAL Heating Boiler

When the specifications for tank heating are greater tha the capacities of Hot Water Supply Boilers, a house-heat ing Boiler may be used by employing the following rule Multiply the specified quantity of water in U. S. gallon to be heated, by the factor in body of table, which coincide with the desired rise in temperature per hour and the tim Boiler must run on one fuel charge, and the result will b the catalogue rating of proper size Ideal Boiler to be used

Boiler will run on one charge of fuel—hours.........	6	7	8	9	10	11	12
Temperature rise in degrees Fahrenheit per hour							
20.....	.83	.97	1.11	1.25	1.39	1.53	1.67
30.....	1.25	1.46	1.67	1.87	2.08	2.29	2.50
40.....	1.67	1.94	2.22	2.50	2.78	3.06	3.33
50.....	2.08	2.43	2.78	3.13	3.47	3.82	4.17
60.....	2.50	2.92	3.33	3.75	4.17	4.58	5.00
70.....	2.92	3.40	3.89	4.37	4.86	5.35	5.83
80.....	3.33	3.89	4.44	5.00	5.56	6.11	6.67
90.....	3.75	4.37	5.00	5.63	6.25	6.87	7.50
100.....	4.17	4.86	5.56	6.25	6.95	7.64	8.34
110.....	4.58	5.35	6.11	6.88	7.64	8.40	9.17
120.....	5.00	5.83	6.67	7.50	8.33	9.17	10.00
130.....	5.41	6.32	7.22	8.12	9.03	9.93	10.84
140.....	5.83	6.81	7.78	8.75	9.72	10.69	11.67
150.....	6.25	7.29	8.33	9.38	10.42	11.46	12.50
160.....	6.66	7.78	8.89	10.00	11.11	12.22	13.33
170.....	7.08	8.26	9.44	10.63	11.81	12.99	14.17

The heating output expressed in terms of square feet of radiation may be used for the purpose of computing the water-heating power of any Ideal Boiler, under any given set of conditions, or vice versa. The examples on the next page will make this statement clear.

How to Determine the Water-Heating or Tank Capacities of any IDEAL Heating Boiler

Example 1.—80 degrees Fahrenheit must be added per hour to 550 gallons of water contained in a 550-gallon storage tank. The heater must be run eight hours on one charge of fuel. Look in the table (page 285) opposite 80 degrees and under eight hours, and find the factor 4.44. Multiply 550 gallons by 4.44 and the result is 2,442 square feet of water boiler capacity. The nearest capacity is 2,475 square feet, which is No. W-3104 Arco.

If the Boiler for above installation must run twelve hours on one fuel charge, a Boiler 50 per cent larger must be selected. Opposite 80 degrees and under twelve hours is the factor 6.67; and 550×6.67 is 3,669 square feet capacity.

Example 2—It is required to add 120 degrees to 1,200 gallons of water every four hours, the Boiler to run eight hours without attention, on one fuel charge. What capacity of Boiler in square feet of radiation should be selected? Turn to the table and find opposite 120 degrees temperature rise, and under eight hours the factor 6.67. Multiply 1,200 gallons by 6.67, which gives a capacity of 8,004 square feet, which is the Boiler capacity if the work must be done in one hour; but as there are four hours in which to do the work, we divide 8,004 by 4, and find the required capacity is 2,001 square feet.

It will be found that there are several different Boilers of about 2,000 feet capacity. If on this job the Boiler must run on one fuel charge for twelve hours without attention a Boiler of 50% more capacity must be selected. Under the hour twelve is the factor 10.00; procedure is $\frac{1,200 \times 10.00}{4} =$ 3,000 square feet capacity.

Example 3.—What size Boiler must be used to heat 1,500 gallons of water from 60 to 160 degrees Fahrenheit in four hours, the Boiler to run nine hours on one fuel charge of hard coal? The factor opposite 100 and under 9 is 6.25. Then $1,500 \times 6.25$ gives a Boiler capacity of 9,375 square feet if the work is done in one hour; but since there are four hours, divide 9,375 by 4, which gives the approximate capacity of 2,344 square feet.

If soft coal is used, see paragraph on soft coal, page 281.

Heating Power of Brass and Iron Pipe Lying Horizontally in Water Storage Tanks

For pipe-coils used in the firepot of steam or water boilers or hot air furnaces in heating water for domestic purposes, etc., there is little difference in the total heat transmitted from the small amount of pipe used—whether iron or brass. But for large water storage tanks where quite a little piping is necessary to heat the water, the results in the use of pipes of these two metals vaiy somewhat. To bring out reliable working information our Institute of Thermal Research has prepared a comparative chart which is reproduced on page 277. It is plotted from numerous tests made with brass and iron pipings, lying in horizontal position in a tank of water. To allow for bad water and the consequent fouling and pitting of pipes, only half of the actual condensing power is shown on the chart

Example 1. It is required to condense 500 pounds of steam per hour in a pipe-coil immersed in the water of a storage tank. How many square feet of pipe should the coil contain?

Temperature of steam in pipe	220 degrees
Initial temperature of water	40 degrees
Terminal temperature of water	160 degrees
Mean temperature of water	100 degrees
Temperature difference steam and water	120 degrees

Observe that the line for IRON pipe intersects the vertical line of 120 degrees temperature difference at the horizontal line representing 22.4 pounds. The intersection of the line for BRASS pipe shows 34.5 pounds.

The quantity of pipe required in square feet is determined by dividing the 500 pounds of steam which must be condensed per hour by the quantity of steam one square foot of pipe will condense. Thus:

For IRON pipe.......$500 \div 22.4 = 22.2$ sq. ft. would be required.

For BRASS pipe......$500 \div 34.5 = 14.5$ sq. ft. would be required.

Example 2. Suppose a tank containing 300 U. S. gallons of cold water at 60 degrees F. is to be heated by low pressure steam (at 5 pounds pressure) to a temperature of 140 degrees, in 2 hours; how many sq. ft. of BRASS pipe will be required, and how much steam will be condensed per hour?

300 U. S gallons weight 300×8.33	2500 pounds
Total temperature rise desired	80 degrees
Temperature rise per hour	40 degrees
Heat required per hour $= 2500 \times 40$	100,000 B. t. u.
Temperature of steam at 5 pounds' pressure (approx.)	227 degrees
Mean temperature of water	100 degrees
Mean temperature difference between steam and water	127 degrees

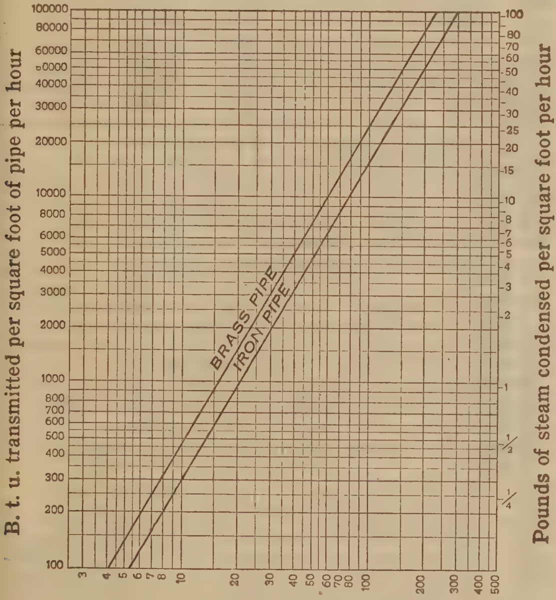
Where the line for BRASS pipe intersects the vertical for 127 degrees, read the transmission per sq. ft., 36,500 B. t. u., and the condensing power, 38 pounds of steam per sq. ft. per hour. The total sq. ft. of BRASS pipe required will then be $100{,}000 \div 36{,}500 = 2.74$ sq. ft. The condensation per hour would be $2.74 \times 38 = 104.1$ pounds.

Heating Power of Brass and Iron Pipe

For Water Storage Tanks

For use with Low Pressure Steam, up to 10 pounds by gauge

A "factor of safety" of 50% is included. to allow fouling of pipe



Temperature difference in Fahr. degrees between steam in coil and mean or average temperature of water in tank. See page 276 for examples.

Hot Water Consumption For Various Types of Buildings.

Figured at a final temperature of 150° Fahr.
GALLONS OF WATER PER HOUR PER FIXTURE

	Apt. House	Club	Gym.	Hospi-tal	Hotel	Indus-Plant	Laundry	Office Bld'g.	Public Bath	Private Res.	School	Y.M.C.A.
Private Lavatory	3	3	3	3	3	3	3	3	3	3	3	3
Public Lavatory	5	8	10	8	10	15	10	8	15		18	10
Bath Tubs	15	15	30	15	15	30			45	15		30
Dish Washers	15	30		30	30	30				15	15	30
Foot Basins	3	3	12	3	3	12				3	3	12
Kitchen Sink	10	20		20	20	20				10	10	20
Laundry Stat. Tubs	25	35		35	35		42			25		35
Laundry Rev. Tubs	75	75		100	150		100-150		100	75		100
Pantry Sinks	10	20		20	20					10	20	20
Showers	50	200	200	50	50	200			200	50	200	200
Slop Sinks	20	20		20	30	20	10	15	15	15	20	20
Dish Washers	300	Gal.	per	hour	at 18	0° fo	r servin	g cap	acity	of 50	0 peo	ple.
TOTAL WATER FOR ALL FIXTURES LIKELY TO BE DRAWN AT ONE TIME—%	20	50	80	60	50	90	100	15	100	50	25	75
STORAGE CAPACITY IN % OF MAXIMUM HEATING CAPACITY	100	75	50	50	25	50	25	100	50	100	50	50

Boiler Power to Heat Swimming Pool

(Copyright, 1905, by American Radiator Company)

In heating large bodies of water, large Boilers are employed, and when anthracite coal is burned in IDEAL Boilers there will be available, from each pound of coal burned, an average of 8,333 British thermal units, or 8.6 pounds water will be evaporated, and on this basis the chart on page 279 is plotted. The basis for finding the size IDEAL Boiler required for a given quantity of work is the number of pounds of hard coal burned per square foot of grate per hour. This quantity varies from 8 to 12 pounds, depending on type of boiler. That IDEAL Boilers will do this work is well proven by actual demonstration, in exhaustive laboratory tests and in regular installations.

The horizontal lines on chart, page 279, represent water in U. S. gallons, which may be increased by any suitable multiplier, provided the coal and steam required are increased in like proportion.

The figures at the bottom of vertical lines show the coal required, each line representing 10 pounds, and those at the top, the steam generated by the combustion of the quantity of coal on the same vertical line—each line representing 86 pounds of steam. The diagonal lines represent the rise, or increase, in temperature of the water per hour in Fahrenheit degrees.

Example 1. What size Boiler is required to warm the water in a swimming-pool containing 130,000 gallons from 40 degrees to 80 degrees in 24 hours, when the water in the pool is circulated through the Boiler?

By reference to chart, page 279, it is found that the horizontal line marked 1,000 gallons intersects the 40-degree diagonal line at the 40-pound vertical line, showing that 40 pounds of coal are required to add 40 degrees to 1,000 gallons of water. Then 100,000 gallons will require 100 times as much coal, or 4,000 pounds. In the same manner 3,000 gallons require 120 pounds, and that 30,000 gallons will require ten times 120, or 1,200 pounds, making a total of 5,200 pounds of coal which must be burned to add 40 degrees to 130,000 gallons of water.

Having twenty-four hours in which to heat the pool, divide 5,200 pounds by 24, and it is found that 216 pounds of coal must be burned per hour for twenty-four hours. Now, as 8 pounds of coal are burned per hour on one square foot of grate, divide 216 by 8, which shows that Boilers containing 27 square feet of grate must be provided. To obtain the 27 square feet of grate, select two No. W-3610, which have 13½ square feet in each. If the temperature of 500 gallons of water must be raised from 40 degrees to 150 degrees Fahrenheit in one hour or through 110 degrees, use the two temperature lines 60 and 50, the sum of which is 110, and as 500 gallons is difficult to read on the chart, use 5,000 gallons and divide the product by 10, thus: 60 degrees added to 5,000 gallons require 300 pounds of coal, and 50 degrees added to 5,000 gallons require 250 pounds, a total of 550 pounds; one-tenth of which is 55 pounds, requiring a Boiler with a grate area of 7 square feet.

How to Find Boiler Power Required to Heat Swimming Pools

(See explanation on pages 279 and 281)

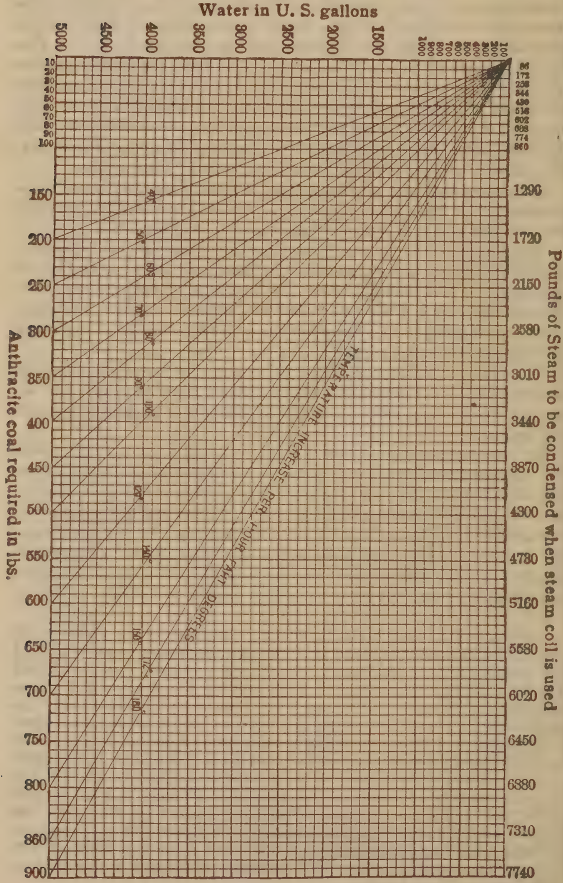


Chart "B"

Boiler Power Required to Heat

Continued

Heating Pools by Steam Coils

Example 2. If the same pool under like conditions is to be heated by steam through pipe coils and the temperature of the steam is 220 degrees, the mean temperature of the water is 40 plus 80 divided by 2 equals 60 degrees and 220 minus 60 equals 160 degrees temperature difference between steam and water.

Turn to chart, page 280, and note that with this temperature difference 1 square foot of iron pipe will condense about 36 pounds of steam per hour, and as 216 pounds of coal must be burned per hour, find by interpolation in chart, page 280, that 216 pounds of coal will evaporate 1,857 pounds steam, which divided by 36 will give in round figures 52 square feet, the amount of condensing pipe required. The grate surface of Boilers will be the same as in Example 1.

Fifty-two square feet is equal to 120 lineal feet of 1¼-inch pipe, 104 feet 1½-inch, or 83 feet 2-inch. If but twelve hours can be allowed to do the work, double the hourly consumption of coal and steam and furnish Boilers of double the capacity required for twenty-four hours' time.

For the twelve-hour period there will be just double the quantity of steam to condense per hour, requiring 104 square feet of condensing coil.

There is, however, another factor which must not be overlooked. In large bodies of water warmed in the manner just described, there will be a zone, of which the condensing pipe is the center, where the mean temperature of the water will be much higher than figured in the foregoing, unless artificial means are employed to agitate the water and keep it all at an even temperature. It will, therefore, be good practice to add at least 50 per cent to the condensing coil when used in large bodies of still water.

Hard Coal versus Soft Coal

All computations in these charts are made on the basis of Anthracite coal. Where it is desired to use fuel other than Anthracite coal proper allowances should be made. Some Bituminous coals and a few grades of Eastern Bituminous yield practically the same quantities of available heat per pound as do Anthracite fuels. Middle West Bituminous, and the lower grades of soft coal, such as Sub-Bituminous and Lignites found in the far West which are very high in volatile and moisture content, vary in their heat value to such an extent as to make it necessary to consider each individual case by itself.

Properties of Saturated Steam

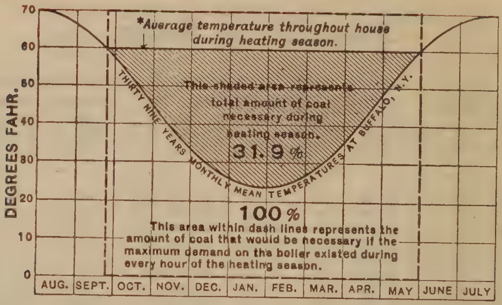
Boiling Temp.	Absolute Press. the Sq. In.	Inches Vacuum	Steam Gauge Press. Lbs	Latent Heat	Heat Liquid	Vol. 1 lb Steam Cu. Ft.
157	4.408	20.94	.....	1003.4	124.86	82.6
161	4.851	20.04	.....	1001.6	127.86	77.2
165	5.333	19.06	.....	998.7	132.86	69.1
169	5.855	18.00	.....	996.4	136.86	63.3
172	6.273	17.15	.....	994.6	139.87	59.4
176	6.867	15.94	.....	992.3	143.87	54.5
179	7.344	14.97	.....	990.5	146.88	51.2
182	7.85	13.94	.....	988.7	149.89	48.12
185	8.38	12.85	.....	986.9	152.89	45.25
187	8.76	12.09	.....	985.7	154.90	43.45
190	9.34	10.90	.....	983.9	157.91	40.91
192	9.74	10.09	.....	982.7	159.91	39.31
194	10.17	9.21	.....	981.5	161.92	37.78
197	10.83	7.87	.....	979.7	164.93	35.62
199	11.29	6.93	.....	978.8	166.94	34.26
201	11.76	5.97	.....	977.2	168.94	32.96
203	12.26	4.96	.....	976.0	170.95	31.72
205	12.77	3.92	.....	974.7	172.96	30.53
207	13.30	2.84	.....	973.5	174.97	29.39
209	13.85	1.73	.....	972.2	176.98	28.32
210	14.13	1.16	.....	971.6	177.99	27.80
212	14.70	.....	.....	970.4	180.00	26.79
215	15.60	.....	0.90	968.4	183.00	25.35
217	16.22	.....	1.72	967.2	185.00	24.44
219	16.86	.....	2.16	965.9	187.10	23.57
222	17.87	.....	3.17	963.9	190.10	22.34
225	18.91	.....	4.21	962.0	193.10	21.17
227	19.64	.....	4.94	960.7	195.20	20.44
230	20.77	.....	6.07	958.7	198.20	19.39
232	21.56	.....	6.86	957.4	200.20	18.72
235	22.79	.....	8.09	955.4	203.2	17.78
237	23.64	.....	8.94	954.1	205.3	17.17
240	24.97	.....	10.27	952.1	208.3	16.32
242	25.88	.....	11.18	950.7	210.3	15.78
244	26.83	.....	12.13	949.4	212.4	15.26
246	27.80	.....	13.10	948.0	214.4	14.76
248	28.80	.....	14.10	946.7	216.4	14.28
250	29.82	.....	15.12	945.3	218.5	13.82
252	30.88	.....	16.18	943.9	220.5	13.37
255	32.53	.....	17.83	941.9	223.5	12.74
257	33.66	.....	18.96	940.5	225.6	12.34
259	34.83	.....	20.13	939.1	227.6	11.95

Properties of Water

Tem. Deg. Fahr.	Weight, per cu. ft. lbs.	Heat of the Liquid B.T.U.	Tem. Deg. Fahr.	Weight, per cu. ft. lbs.	Heat of the Liquid B.T.U.	Tem. Deg. Fahr.	Weight, per cu. ft. lbs.	Heat of the Liquid B.T.U.
32	62.42	0.00	123	61.68	90.90	168	60.81	135.86
35	62.42	3.02	124	61.67	91.90	169	60.79	136.86
40	62.42	8.05	125	61.65	92.90	170	60.77	137.87
45	62.42	13.07	126	61.63	93.90	171	60.75	138.87
50	62.41	18.08	127	61.61	94.89	172	60.73	139.87
52	62.40	20.08	128	61.60	95.89	173	60.70	140.87
54	62.40	22.08	129	61.58	96.89	174	60.68	141.87
56	62.39	24.08	130	61.56	97.89	175	60.66	142.87
58	62.38	26.08	131	61.54	98.89	176	60.64	143.87
60	62.37	28.08	132	61.52	99.88	177	60.62	144.88
62	62.36	30.08	133	61.51	100.88	178	60.59	145.88
64	62.35	32.07	134	61.49	101.88	179	60.57	146.88
66	62.34	34.07	135	61.47	102.88	180	60.55	147.88
68	62.33	36.07	136	61.45	103.88	181	60.53	148.88
70	62.31	38.06	137	61.43	104.87	182	60.50	149.89
72	62.30	40.05	138	61.41	105.87	183	60.48	150.89
74	62.28	42.05	139	61.39	106.87	184	60.46	151.89
76	62.27	44.04	140	61.37	107.87	185	60.44	152.89
78	62.25	46.04	141	61.36	108.87	186	60.41	153.89
80	62.23	48.03	142	61.34	109.87	187	60.39	154.90
82	62.21	50.03	143	61.32	110.87	188	60.37	155.90
84	62.19	52.02	144	61.30	111.87	189	60.34	156.90
86	62.17	54.01	145	61.28	112.86	190	60.32	157.91
88	62.15	56.01	146	61.26	113.86	191	60.29	158.91
90	62.13	58.00	147	61.24	114.86	192	60.27	159.91
92	62.11	60.00	148	61.22	115.86	193	60.25	160.91
94	62.09	61.99	149	61.20	116.86	194	60.22	161.92
96	62.07	63.98	150	61.18	117.86	195	60.20	162.92
98	62.05	65.98	151	61.16	118.86	196	60.17	163.92
100	62.02	67.97	152	61.14	119.86	197	60.15	164.93
102	62.00	69.96	153	61.12	120.86	198	60.12	165.93
104	61.97	71.96	154	61.10	121.86	199	60.10	166.94
106	61.95	73.95	155	61.08	122.86	200	60.07	167.94
108	61.92	75.95	156	61.06	123.86	201	60.05	168.94
110	61.89	77.94	157	61.04	124.86	202	60.02	169.95
112	61.86	79.93	158	61.02	125.86	203	60.00	170.95
114	61.83	81.93	159	61.00	126.86	204	59.97	171.96
115	61.82	82.92	160	60.98	127.86	205	59.95	172.96
116	61.80	83.92	161	60.96	128.86	206	59.92	173.97
117	61.78	84.92	162	60.94	129.86	207	59.89	174.97
118	61.77	85.92	163	60.92	130.86	208	59.87	175.98
119	61.75	86.91	164	60.90	131.86	209	59.84	176.98
120	61.74	87.91	165	60.87	132.86	210	59.82	177.99
121	61.72	88.91	166	60.85	133.86	211	59.79	178.99
122	61.70	89.91	167	60.83	134.86	212	59.76	180.00

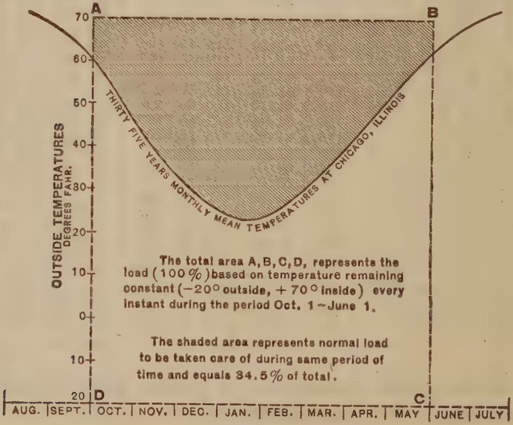
NOTE—Above information is quoted from standard authorities. Not guaranteed.

ACTUAL vs. THEORETICAL SEASON'S FUEL DEMAND

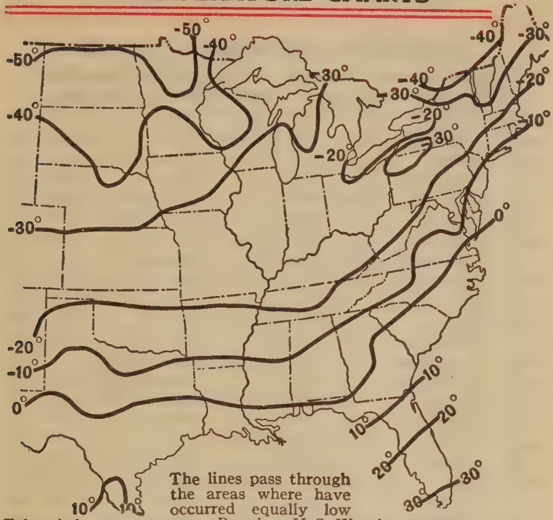


It is generally believed and is probably true that if the prospective purchaser is told that 500 square feet of radiation will require 14 pounds of coal per hour to keep the radiation steadily filled with steam he will multiply the 14 pounds by 5,000 hours (the average length of the northern heating season), showing a consumption of thirty-five tons of coal. Whereas the **maximum hourly demand** is no indication of the season's **normal demand** because the entire quantity of radiation is in commission for very short periods, two or three hours per day for a total of possibly ten or twelve days during the entire heating season. The maximum hourly demand indicates thirty-five tons for a season while good practice demonstrates that the consumption will be about ten to twelve tons.

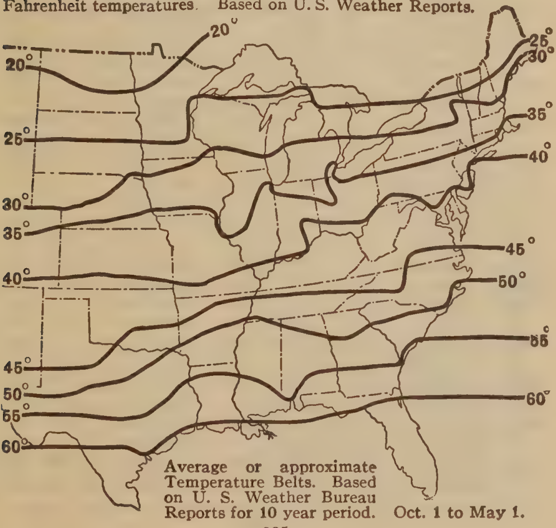
In other words, the coal required for a heating season is about one-third the quantity that would be used if all radiation were in constant use every hour of the day and night.



TEMPERATURE CHARTS



The lines pass through the areas where have occurred equally low Fahrenheit temperatures. Based on U. S. Weather Reports.



Average or approximate Temperature Belts. Based on U. S. Weather Bureau Reports for 10 year period. Oct. 1 to May 1.

CLIMATIC TEMPERATURES

Lowest and Average Degrees in the U. S.

***October 1st to May 1st. All stated in Fahrenheit**
(Compiled from U. S. Weather Bureau Records)

State	City	Lowest	*Av.
Ala.	Mobile	– 1	57.7
	Montgomery	– 5	56.1
Ariz.	Flagstaff	–21	34.8
	Phoenix	22	58.9
Ark.	Fort Smith	–15	49.5
	Little Rock	–12	52.0
Cal.	San Diego	32	57.2
	Independence	10	48.7
Colo.	Denver	–29	38.4
	Grand Jct	–16	39.2
Conn.	Southington	–19	36.3
D. C.	Washington	–15	42.9
Fla.	Jupiter	24	69.8
	Jacksonville	10	60.9
Ga.	Savannah	8	57.2
	Atlanta	– 8	51.4
Idaho	Boise	–28	39.6
	Lewiston	–18	42.5
Ill.	Chicago	–23	35.9
	Springfield	–22	39.0
Ind.	Indianapolis	–25	40.4
	Evansville	–15	44.1
Ia.	Sioux City	–31	32.1
	Keokuk	–26	37.6
Kan.	Dodge City	–26	....
	Wichita	–22	42.9
Ky.	Louisville	–20	45.0
La.	New Orleans	7	60.5
	Shreveport	– 5	55.7
Me.	Eastport	–21	31.1
	Portland	–17	33.5
Md.	Baltimore	– 7	43.3
Mass.	Boston	–13	37.2
Mich.	Alpena	–27	29.1
	Detroit	–24	35.3
Minn.	Duluth	–41	25.5
	Minneapolis	–33	28.4
Miss.	Meridian	– 6	53.9
	Vicksburg	– 1	56.0
Mo.	Springfield	–29	43.0
	Hannibal	–20	39.7
Mont.	Havre	–55	27.7
	Helena	–42	30.9
Neb.	North Platte	–35	34.6
	Lincoln	–29	35.8
Nev.	Carson City	–22	....
	Winnemucca	–28	37.9
N. H.	Concord	–35	33.1
N. J.	Atlantic City	– 7	41.6
N. Y.	Saranac Lake	–38	34.1
	New York City	– 6	40.1
N. M.	Roswell	–14	48.9
	Santa Fe	–13	38.0
N. C.	Hatteras	8	53.3
	Charlotte	– 5	49.8
N. D.	Devil's Lake	–51	18.9
	Bismarck	–44	23.5
Ohio	Toledo	–16	36.8
	Columbus	–20	39.8
Okla.	Oklahoma City	–17	47.1
Ore.	Baker City	–20	34.1
	Portland	– 2	45.4
Pa.	Pittsburgh	–20	40.8
	Philadelphia	– 6	41.8
R. I.	Providence	– 9	37.5
	Block Island	– 4	39.7
S. C.	Charleston	7	56.9
	Columbia	2	53.5
S. D.	Huron	–43	25.9
	Yankton	–32	31.2
Tenn.	Knoxville	–16	47.0
	Memphis	– 9	50.7
Tex.	Corpus Christi	11	62.7
	Fort Worth	– 8	49.5
Utah	Salt Lake City	–20	39.7
Vt.	Northfield	–32	27.8
Va.	Cape Henry	5	48.6
	Lynchburg	– 5	45.2
Wash.	Seattle	3	44.3
	Spokane	–30	37.0
W. Va.	Parkersburg	–27	41.9
	Elkins	–21	38.8
Wis.	La Crosse	–43	31.2
	Milwaukee	–25	32.4
Wyo.	Cheyenne	–38	33.7
	Lander	–36	29.0

VELOCITY OF WINDS IN UNITED STATES

Average hourly velocity of the wind at selected stations.

Stations	Average Hourly Velocity	Highest Ever Reported	Stations	Average Hourly Velocity	Highest Ever Reported
	Mi.	Mi.		Mi.	Mi.
Abilene, Texas	11	66	Leavenworth, Kan.†	7	66
Albany, N. Y	6	70	Louisville, Ky	7	60
Alpena, Mich	9	72	Lynchburg, Va	4	50
Atlanta, Ga	9	66	Memphis, Tenn	6	75
Bismarck, N. D	8	74	Montgomery, Ala	5	54
Boise, Idaho	4	55	Nashville, Tenn	6	75
Boston, Mass	11	72	New Orleans, La	7	66
Buffalo, N. Y	11	90	New York City, N. Y.	9	96
Charlotte, N. C	5	55	North Platte, Neb	9	96
Chattanooga, Tenn	6	60	Omaha, Neb	8	66
Chicago, Ill	9	84	Palestine, Texas	8	60
Cincinnati, Ohio	7	59	Philadelphia, Pa	10	75
Cleveland, Ohio	9	73	Pittsburgh, Pa	6	69
Custer, Mont.†	7	72	Portland, Me	5	61
Denver, Colo	7	75	Red Bluff, Cal	7	60
Detroit, Mich	9	76	Rochester, N. Y	11	78
Dodge City, Kan	11	75	St. Louis, Mo	11	80
Dubuque, Iowa	5	60	St. Paul, Minn	7	102
Duluth, Minn	7	78	St. Vincent, Minn.†	9	72
Eastport, Me	9	78	Salt Lake City, Utah	5	66
El Paso, Texas	5	78	San Diego, Cal	6	43
Fort Smith, Ark	5	66	San Francisco, Cal	9	60
Galveston, Texas	10	*84	Santa Fe, N. M	6	53
Havre, Mont	11	76	Savannah, Ga	7	88
Helena, Mont	6	70	Spokane, Wash	4	52
Huron, S. D	10	69	Toledo, Ohio	9	72
Jacksonville, Fla	6	70	Vicksburg, Miss	6	62
Keokuk, Iowa	8	60	Washington, D. C	5	66
Knoxville, Tenn	5	84	Wilmington, N. C	7	68

*Anemometer blew away at a velocity of 84 miles per hour September, 1900. †Stations discontinued.

Standard Table Showing Velocity and Force of Winds

Description	Miles per Hour	Feet per Minute	Feet per Second	Force in lbs. per Square Foot
Perceptible	1	88	1.47	.005
Just perceptible	2	176	2.93	.020
	3	264	4.4	.044
Gentle breeze	4	352	5.87	.079
	5	440	7.33	.123
Pleasant breeze	10	880	14.67	.492
	15	1,320	22.0	1.107
Brisk wind	20	1,760	29.3	1.968
	25	2,200	36.6	3.075
High wind	30	2,640	44.0	4.428
	35	3,080	51.3	6.027
Very high wind	40	3,520	58.6	7.872
	45	3,960	66.0	9.963
Storm	50	4,400	73.3	12.300
Great Storm	60	5,280	88.0	17.712
	70	6,160	102.7	24.108
Hurricane	80	7,040	117.3	31.488
	100	8,800	146.6	49.200

Ventilation is defined as the process and practice of keeping an enclosed place supplied with proper air for breathing. Air consists of nitrogen, oxygen, and certain small proportions of other gases, such as carbon dioxide, ozone, and argon. Oxygen, which is the active and important constituent, and on which life and combustion depend, forms about one-fifth of the whole, while nitrogen, which is inert and acts as a diluent, forms nearly four-fifths. Of this mixture each adult person breathes some 2600 gallons or 425 cub. ft. in twenty-four hours. In air that has passed through the lungs the proportion of oxygen is reduced and that of carbon dioxide increased. Of the various impurities that are found in the air of inhabited rooms, carbon dioxide forms the best practical index of the efficiency of the ventilation.

Ventilation consists briefly of all the artificial air conditioning necessary to maintain the air inside of a building in a condition desirable for certain purposes (either for breathing or to suit given manufacturing processes) and at such standards as may be regarded as desirable.

The most common form of ventilation is that used to furnish an air supply (and sometimes an air exhaust) for the occupants of a building (without which the interior air would become foul) and also for the purpose of removing objectionable odors—such as in kitchens, restaurants, and toilet rooms.

In past years the amount of carbon dioxide in the air has been used to determine the comparative degree of purity even though it has been understood that carbon dioxide itself is not dangerous. This is because pure air seldom contains over 4 parts in 10,000, while in air used for

breathing purposes the number of parts rises rapidly and almost proportionately with the other impurities contained in exhaled air. Therefore, a statement of the amount of carbon dioxide present in a given sample of air—a measurement comparatively easy to make—may be taken as indicative of the amount of other impurities.

Each person gives off about 0.6 cu. ft. of carbonic acid per hour. If the fresh air entering a room has 4 parts in 10,000 of carbon dioxide and the limit in the room is desired to be kept below a certain number of parts the number of cubic feet per minute per occupant must be not less than as follows

Limit of Parts of Carbon dioxide 10,000 Parts of Air	Cubic Feet of Fresh Air Necessary per Minute per Occupant
5	133
6	67
7	44
8	33
9	27
10	22
11	19
12	17

While these are the theoretical amounts of air required, some consideration must be shown for the quantity of air contained in the room at the beginning of its occupancy and also the length of time the room is occupied. Thus, a church where the services are short and the volume of fresh air large at the beginning requires less air to ventilate than a moving picture theater running continuously for ten hours a day and usually in more or less cramped quarters.

As the respired air is immediately diffused in the air of the room, it cannot be directly removed, but only diluted till it ceases to be harmful. There is, therefore, no definite standard of purity, and any line drawn between good and poor ventilation is arbitrary. Pure air contains 3 to 4 parts of carbon dioxide in 10,000. With an increase to 11 parts in 10,000, the air becomes noticeably oppressive, while an increase of 3 parts or a total of 6 to 7 parts is scarcely noticeable.

Comfort Zone

At one time it was thought that any temperature change, as measured by the thermometer, directly affected comfort—that the more the temperature varied from 70° F. the less comfortable. Today it is known that temperature (dry bulb) is only one of several physical conditions affecting the comfort of the individual.

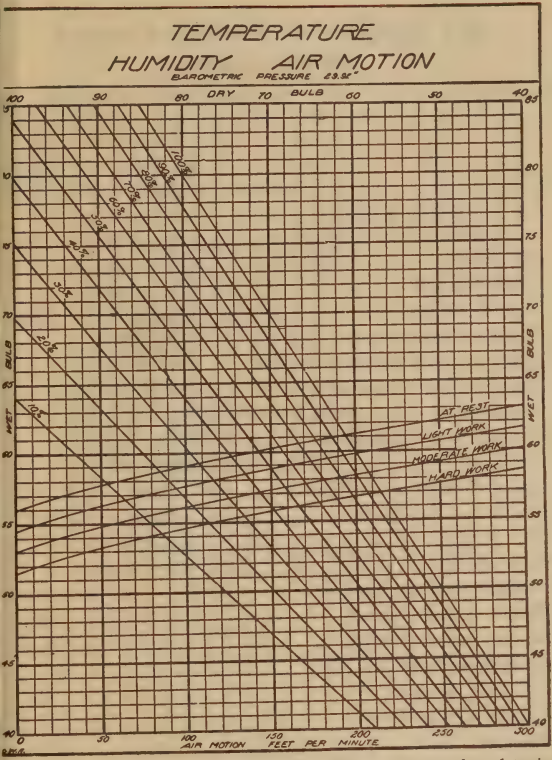
We know that if the air is very dry or of low relative humidity the temperature (dry bulb) must be higher than when the air is moist to produce the same apparent temperature, due to the more rapid evaporation of moisture from the skin. The faster evaporation takes place, the greater the cooling affect.

In addition to temperature and humidity the velocity of air moving over a person has a decided affect upon the apparent temperature, as the greater the velocity the more the evaporation and the greater the cooling.

A thermometer whose bulb is surrounded with moist wicking gives what is known as the wet bulb temperature. Although alone this does not record the actual humidity it is very indicative of same. Such a wet bulb thermometer also is affected by air motion. It, therefore, is very useful in recording the apparent temperature of a room.

Numerous tests have been made from which the chart on opposite page has been prepared. This chart shows the so-called Comfort Zone. It shows that a person at rest feels the same apparent temperature when the dry bulb thermometer is at 61° F., wet bulb 61°, and the air saturated, (at 100% humidity) as he does when the dry bulb temperature is 70° F., wet bulb 60°, and humidity 55%; or the dry bulb at 80° F., wet bulb 59°, and the humidity 27%. The air motion measured in feet per minute is 195, 150 and 100 ft. respectively.

When a person is actively engaged in manual labor he is producing sufficient extra internal warmth to allow him to work with equal comfort in a lower temperature. This is illustrated by the chart where it is seen that dry bulb 57° F., wet bulb 57°, 100% humidity, is of equal comfort to dry bulb 70°, wet bulb 56°, 39% humidity.



The above chart illustrates the so called Comfort Zone referred to in text on opposite page.

It will be noted that for each class of work the wet bulb temperature varies but little even though the dry bulb temperature does.

The above examples illustrate that by maintaining relatively moist air, lower temperatures are possible and because of this lower temperature less fuel is necessary. Within reasonable limits it may be said that fuel may be saved by proper humidity control.

Air Supplied to Various Classes of Buildings

	Cu. Ft. per hr. per Occupant	No. of Air Changes
Churches, Assembly Rooms and Auditoriums	1200–1800	......
Theatres	1000–1200	......
Grade Schools	1000–1500	......
High Schools	1200–1800	......
College Class Rooms	1500–2000	......
Hospitals for Ordinary Diseases	2500–3500	......
Hospitals for Children	2000–2500	......
Hospitals for Contagious Diseases	5000–5500	......
Hospitals for Wounded	3500–5000	......
Barracks	1000–1800	......
Living Rooms in Residences	1200	1 to 2
Stairways and Halls	600	½ to 1
Bed Rooms	1000	1½
Workshops	600–2000	......
Public Waiting Rooms	....	4
Public Toilet Rooms	....	10
Small Convention Halls	....	4
General Offices	....	3
Private Offices	....	4
Public Dining Rooms	....	4
Banquet Halls	....	5
Basement Restaurants	....	8 to 12
Hotel Kitchens	....	4 to 6
Public Libraries	....	3
Textile Mills	....	4
Engine Rooms	....	3 to 6
Boiler Rooms	....	2 to 6
Railroad Round Houses	....	12

The above table is reprinted from "Heating and Ventilation" by Allen and Walker.

Temp. Degrees Fahrenheit	B. t. u. absorbed by 1 Cubic Foot Dry Air per Degree Fahr.	B. t. u. absorbed by 1 Cubic Foot Saturated Air per Degree Fahr.	Cubic Feet Dry Air Warmed 1 Degree per B. t. u.	Cubic Feet Saturated Air warmed 1 Degree per B. t. u.
0	0.02056	0.02054	48.5	48.7
12	0.02004	0.02006	50.1	50.0
22	0.01961	0.01963	51.1	51.0
32	0.01921	0.01924	52.0	51.8
42	0.01882	0.01884	53.2	52.8
52	0.01847	0.01848	54.0	53.8
60	0.01818	0.01822	55.0	54.6
62	0.01811	0.01812	55.2	54.7
70	0.01777	0.01794	56.3	55.5
72	0.01777	0.01790	56.5	55.8
82	0.01744	0.01770	57.2	56.5
92	0.01710	0.01751	58.5	57.1
100	0.01690	0.01735	59.1	57.8
102	0.01682	0.01731	59.5	57.8
112	0.01651	0.01711	60.6	58.5
122	0.01623	0.01691	61.7	59.1
132	0.01596	0.01670	62.5	59.9
142	0.01571	0.01652	63.7	60.6
152	0.01544	0.01634	65.0	61.5
162	0.01518	0.01616	66.2	62.4
172	0.01494	0.01598	67.1	63.3
182	0.01471	0.01580	68.0	64.2
192	0.01449	....	68.9	....
202	0.01426	....	69.5	....
212	0.01406	....	71.4	....

Volume and Density of Air

at Various Temperatures

Temp. Degrees Fahr.	Volume of 1 lb. of Air at Atmospheric Pressure of 14.7 lbs. Cubic Feet	Density or Weight of 1 Cu. Ft. of Air at 14.7 lbs. Pressure Lbs.	Temp. Degrees Fahr.	Volume of 1 lb. of Air at Atmospheric Pressure of 14.7 lbs. Cubic Feet	Density or Weight of 1 Cu. Ft. of Air at 14.7 lbs. Pressure Lbs.
0	11.583	0.086331	210	16.860	0.059313
32	12.387	0.080728	212	16.910	0.059135
40	12.586	0.079439	220	17.111	0.058442
50	12.840	0.077884	240	17.612	0.056774
62	13.141	0.076097	260	18.116	0.055200
70	13.342	0.074950	280	18.621	0.053710
80	13.593	0.073565	300	19.121	0.052297
90	13.845	0.072230	320	19.624	0.050959
100	14.096	0.070942	340	20.126	0.049686
120	14.592	0.068500	360	20.630	0.048476
140	15.100	0.066221	380	21.131	0.047323
160	15.603	0.064088	400	21.634	0.046223
180	16.106	0.062090	425	22.262	0.044920
200	16.606	0.060210	450	22.890	0.043686

NOTE.—Above information is quoted from standard authorities. Not guaranteed.

Moisture Absorbed

The quantity of water which air is capable of absorbing to the point of maximum saturation, in grains per cubic foot for various temperatures.

Degrees Fahr.	Grains in a Cu. Ft.	Degrees Fahr.	Grains in a Cu. Ft.	Degrees Fahr.	Grains in a Cu. Ft.	Degrees Fahr.	Grains in a Cu. Ft.
—20	0.219	25	1.611	55	4.849	75	9.356
—10	0.356	30	1.958	57	5.191	77	9.961
— 5	0.450	32	2.113	60	5.744	80	10.933
0	0.564	35	2.366	62	6.142	85	12.736
5	0.705	40	2.849	65	6.782	90	14.791
10	0.873	45	3.414	67	7.241	95	17.124
15	1.075	50	4.076	70	7.980	100	19.766
20	1.321	52	4.372	72	8.508	105	22.751

Relative Humidity of the Air

Difference of Temp. Wet and Dry Bulb	Temperature of the Air			Difference of Temp. Wet and Dry Bulb	Temperature of the Air		
	32 Degrees Fahr.	70 Degrees Fahr.	90 Degrees Fahr.		32 Degrees Fahr.	70 Degrees Fahr.	90 Degrees Fahr.
0.5	95	98	98	9.0	12	60	68
1.0	90	95	96	10.0	3	55	65
2.0	79	90	92	12.0	..	48	59
3.0	69	86	88	14.0	..	40	53
4.0	59	81	85	16.0	..	33	47
5.0	50	77	81	18.0	..	26	41
6.0	40	72	78	20.0	..	19	36
7.0	31	68	75	22.0	..	13	32
8.0	21	64	71	24.0	..	7	26

Volume of Air Necessary for Standard of Purity

Cu. Ft. of Space in Room per Individual	Proportion of Carbonic Acid in 10,000 Parts of the Air not to be exceeded at end of hour						
	6	7	8	9	10	15	20
	Cubic Feet of Air, of Composition Four Parts of Carbonic Acid in 10,000, to be supplied the first hour						
100	2900	1900	1400	1100	900	445	275
200	2800	1800	1300	1000	800	345	175
300	2700	1700	1200	900	700	245	75
400	2600	1600	1100	800	600	145	None
500	2500	1500	1000	700	500	45	...
600	2400	1400	900	600	400	None	...
700	2300	1300	800	500	300	...	...
800	2200	1200	700	400	200	...	...
900	2100	1100	600	300	100	...	...
1000	2000	1000	500	200	None	...	...
1500	1500	500	None	None	...	...	...
2000	1000	None	...	...	...	...	...
2500	500	...	...	...	...	...	...

NOTE.—Above information is quoted from standard authorities. Not guaranteed.

AIR HEATING TABLE

Cubic feet of air one B. t. u. will raise one degree Fahr. at different temperatures:

Specific heat of air .2375. At zero one cubic foot of air weighs .0864 lb. and $\frac{1 \text{ lb.}}{.0864} = 11.574$ cu. ft. $\frac{11.574}{.2375} = 48.77$ cu. ft. raised one degree by 1 B. t. u.

From this formula the following table is constructed, small fractional decimals being omitted.

Temp. air F. deg.	Weight of 1 cu. ft.	Cu. ft. in 1 lb.	Cu. ft. 1 H. U. will raise 1 deg. F.	Temp. air F. deg.	Weight of 1 Cu. ft.	Cu. ft. in 1 lb.	Cu. ft. H. U. will raise 1 deg. F.
0	.0864	11.58	48.77	112	.0694	14.40	60.60
12	.0842	11.87	50.00	122	.0682	14.65	61.60
22	.0824	12.14	51.00	132	.0671	14.90	62.80
32	.0807	12.40	52.20	142	.0660	15.15	63.80
42	.0791	12.64	53.10	152	.0649	15.40	64.90
52	.0776	12.88	54.10	162	.0638	15.65	66.00
62	.0761	13.13	55.20	172	.0628	15.90	67.00
70	.0750	13.34	56.30	182	.0618	16.17	68.00
72	.0747	13.39	56.40	192	.0609	16.42	69.10
82	.0733	13.64	57.40	202	.0600	16.67	70.10
92	.0720	13.90	58.60	212	.0591	16.92	71.30
102	.0707	14.14	59.20				

B. t. u. Required for Heating Air

This table specifies the quantity of heat in British thermal units required to raise one cubic foot of air through any given temperature interval.

External Temp.	Temperature of Air in Room									
	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°
−40°	1.802	2.027	2.252	2.479	2.703	2.928	3.154	3.379	3.604	3.829
−30°	1.540	1.760	1.980	2.200	2.420	2.640	2.860	3.080	3.300	3.520
−20°	1.290	1.505	1.720	1.935	2.150	2.365	2.580	2.795	3.010	3.225
−10°	1.051	1.262	1.473	1.684	1.892	2.102	2.311	2.522	2.732	2.943
0°	0.822	1.028	1.234	1.439	1.645	1.851	2.056	2.262	2.467	2.673
10°	0.604	0.805	1.007	1.208	1.409	1.611	1.812	2.013	2.215	2.416
20°	0.393	0.590	0.787	0.984	1.181	1.378	1.575	1.771	1.968	2.165
30°	0.192	0.385	0.578	0.770	0.963	1.155	1.345	1.540	1.733	1.925
40°	0.000	0.188	0.376	0.564	0.752	0.940	1.128	1.316	1.504	1.692
50°	. . . .	0.000	0.184	0.367	0.551	0.735	0.918	1.102	1.286	1.470
60°	. . . .	. . . .	0.000	0.179	0.359	0.538	0.718	0.897	1.077	1.256
70°	. . . .	. . . .	. . . .	0.000	0.175	0.350	0.525	0.700	0.875	1.049

Above table from standard authorities, not guaranteed.

CONSTANTS OF HEAT TRANSMISSION

Following list shows the coefficient of heat transmission (B.t.u's transmitted per square foot per hour per degree difference in temperature between inside and outside) for various building structures.

Walls		Coef.
Plain Brick	4″ thick	0.64
	8″ thick	0.42
	12″ thick	0.31
	16″ thick	0.26
Brick Furred and Plastered*	4″ thick	0.33
	8″ thick	0.27
	12″ thick	0.24
	16″ thick	0.21
Concrete	4″ thick	0.90
	6″ thick	0.75
	8″ thick	0.60
	12″ thick	0.45
	16″ thick	0.40
Terra Cotta or Hollow Tile Stucco.	4″ thick	0.57
	8″ thick	0.42
	12″ thick	0.38
	16″ thick	0.30
Terra Cotta or Hollow Tile Furred and Plastered	8″ thick	0.28
	12″ thick	0.25
	16″ thick	0.22
8″ Cement Blocks		0.63
8″ Cement Blocks Furred and Plastered		0.40
Doors		
Single Doors		0.42
Double Doors		0.28
Glass		
Single Window		1.20
Double Window		0.60
Skylight		1.30
Monitor Glass		1.30
Air Changes		
One (1) Air Change		.0181
Two (2) Air Change		.0362
Three (3) Air Change		.0543
Floors		
Dirt as flooring		.22

Floors—Continued	Coef.
Cement or Tile on Dirt	0.3[illegible]
Wooden beams. Planked on Dirt	0.13
Floors Exposed to Air below	
¾″ Flooring on Joists	0.32
¾″ Flooring on Joists. Lath and Plaster beneath	0.24
Double Flooring on Joists	0.25
Double Flooring on Joists Lath and Plaster beneath	0.16
Ceiling	
Lath and Plaster. No flooring above	0.50
Lath and plaster. Single floor above	0.28
Steel Ceiling with floor above	0.35
Roof	
2″ Concrete Cinder Fill Tar and Gravel	0.80
4″ Concrete Cinder Fill Tar and Gravel	0.60
6″ Concrete Cinder Fill Tar and Gravel	0.54
⅝″ to 1″ Tile on Wood Sheathing	0.40
⅝″ to 1″ Tile, no Boards Underneath	1.10
Sheet Iron, no Boards Underneath	1.30
Slate on Shingle Lath	0.85
Slate on Wood Sheathing	0.38
Wood Shingles on Shingle Lath	0.63
Wood Shingles on Tight Sheathing	0.32
Composition Roof Paper on 1″ Boards	0.44
Composition Roof Paper on 1½″ Boards	0.32
Composition Roof Paper on 2″ Boards	0.27

*Brick or Terra Cotta Walls when Furred and Plastered have a narrow wood strip nailed to brick work and are lathed and plastered over these strips; this construction provides an air space.

The amount of Square Feet of each kind of surface is to be multiplied by its respective constant as shown above and by the difference in temperature between both sides of the surface, i. e., walls, ceilings, floors, windows and doors.

Heat loss through air changes is calculated on the Cubic Feet of Contents, otherwise figured the same by use of their constants given for different air changes.

The sum of the above gives the loss of heat in B. t. u.'s for all exposures.

Add to Radiation for Intermittent Heating

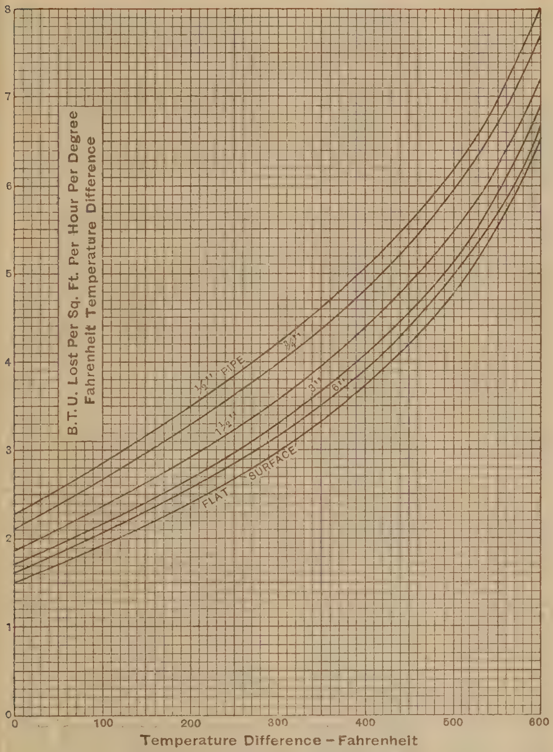
Ten per cent if heated day time only, and the location of the building is not exposed.

Twenty per cent when the building is heated day time only, and the location of the building is exposed.

Thirty per cent when the building is heated intermittently with long intervals of non-heating.

NOTE.—The above factors are compiled from well-known authorities but are not guaranteed.

HEAT LOSS FROM PIPING



HEAT LOSS FROM BARE PIPES

From this chart the number of B. T. U. lost per sq. ft. per hour per degree F, temperatures difference can be obtained for various sizes of bare pipe for various temperature differences between steam inside and air surrounding the pipe.

For example: To determine B. t. u. loss per sq. ft. per hour per degree difference in temperature from 1½" pipe with a temperature difference of 150°F, proceed as follows: at 150°F temperature difference, follow the vertical line to intersection of curve for 1½" pipe and read at left hand side of chart 2.65 B. t. u. loss per sq. ft. per hour per degree difference of temperature.

Table Showing Cubic Air Content of Rooms of various Dimensions

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Height of Ceiling	WIDTH and LENGTH OF ROOM (FEET)														
	3x16½	4x18¾	5x20	6x21	7x21½	8x22	9x22	10x22½	11x23	12x23	13x23	14x23	15x23	16x23½	17x23½
	4x12½	5x15	6x16½	7x18	8x18¾	9x19½	10x20	11x20½	12x21	13x21	14x21½	15x22	16x22	17x22	18x22½
	5x10	6x12½	7x14½	8x15½	9x16½	10x17½	11x18	12x18¾	13x19	14x20	15x20	16x20	17x20½	18x21½	19x21½
	6x8½	7x10½	8x12½	9x14	10x15	11x16	12x16½	13x17¼	14x18	15x18	16x18½	17x19½	18x19½	19x20½	20x20
	7x7	8x9½	9x11	10x12½	11x13½	12x14½	13x15½	14x16	15x16½	16x17½	17x17½	18x18	19x18	20x19	21x19
	8x6½	9x8½	10x10	11x11½	12x12½	13x13½	14x14¼	15x15	16x15	17x16	18x16	19x17	20x17	21x18	22x18
	CUBIC CONTENT (CUBIC FEET)														
8	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200
8½	425	640	850	1060	1275	1490	1700	1910	2125	2340	2550	2760	2975	3190	3400
9	450	675	900	1125	1350	1575	1800	2020	2250	2480	2700	2920	3150	3370	3600
9½	475	715	950	1190	1425	1660	1900	2140	2375	2610	2850	3090	3325	3560	3800
10	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000	3250	3500	3750	4000
10½	525	790	1050	1310	1575	1840	2100	2360	2625	2890	3150	3420	3675	3940	4200
11	550	825	1100	1375	1650	1925	2200	2480	2750	3030	3300	3580	3850	4130	4400
11½	575	860	1150	1440	1725	2010	2300	2600	2875	3170	3450	3740	4025	4310	4600
12	600	900	1200	1500	1800	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
12½	625	940	1250	1560	1875	2190	2500	2820	3125	3440	3750	4070	4375	4690	5000
13	650	980	1300	1625	1950	2280	2600	2930	3250	3580	3900	4240	4550	4880	5200

Example. To find cubic content of a room 10 feet wide by 10 feet long and 9 feet high proceed as follows: Locate in top table width and length dimensions of room (10 x 10); read directly down in this same column opposite the ceiling height 9 (feet) shown at left hand side of page. The cubic content of room is 900 cubic feet.

Full Area of Two-Pane Windows

Given the Total Area of Two-Pane Windows, Including the Sash

Standard Sizes of Two-Light Windows

Width Glass In.	Width of Open'g Ft. In. \ Height Glass	18″	20″	22″	24″	26″	28″	30″	32″	34″	36″	38″	40″	42″	44″	46″	48″	50″	52″
	Height Open'g	3′-6″	3′-10″	4′-2″	4′-6″	4′-10″	5′-2″	5′-6″	5′-10″	6′-2″	6′-6″	6′-10″	7′-2″	7′-6″	7′-10″	8′-2″	8′-6″	8′-10″	9′-2″
16	1- 8	5.8	6.4	7.0	7.5	8.0	8.6	9.2	9.7	10.3	10.8	11.4	11.9	12.5	13.0	13.6	14.2	14.7	15.2
18	1-10	6.4	7.0	7.6	8.2	8.9	9.5	10.1	10.7	11.3	11.9	12.5	13.1	13.7	14.3	15.0	15.6	16.2	16.8
20	2- 0	7.0	7.7	8.3	9.0	9.7	10.3	11.0	11.7	12.3	13.0	13.6	14.3	15.0	15.6	16.3	17.0	17.7	18.3
22	2- 2	7.6	8.3	9.0	9.7	10.5	11.2	11.9	12.6	13.4	14.0	14.7	15.5	16.2	17.0	17.7	18.4	19.2	19.8
24	2- 4	8.2	8.9	9.7	10.5	11.3	12.0	12.8	13.6	14.4	15.1	15.9	16.7	17.4	18.2	19.0	19.8	20.6	21.4
26	2- 6	8.7	9.6	10.4	11.2	12.0	12.8	13.7	14.6	15.4	16.2	17.1	17.9	18.7	19.5	20.4	21.2	22.0	23.0
28	2- 8	9.3	10.2	11.1	12.0	12.9	13.8	14.7	15.5	16.4	17.3	18.2	19.1	20.0	20.8	21.8	22.6	23.5	24.4
30	2-10	10.0	10.8	11.8	12.8	13.7	14.6	15.6	16.5	17.5	18.4	19.3	20.3	21.2	22.2	23.2	24.0	25.0	26.0
32	3- 0	10.5	11.5	12.5	13.5	14.5	15.5	16.5	17.5	18.5	19.5	20.5	21.5	22.5	23.5	24.5	25.5	26.5	27.5
34	3- 2	11.0	12.1	13.2	14.3	15.3	16.4	17.4	18.5	19.5	20.6	21.6	22.6	23.7	24.8	25.8	27.0	28.0	29.0
36	3- 4	11.7	12.8	13.9	15.0	16.1	17.2	18.3	19.5	20.5	21.6	22.8	23.8	25.0	26.1	27.2	28.3	29.4	30.5
38	3- 6	12.2	13.4	14.6	15.8	16.9	18.0	19.2	20.4	21.6	22.7	24.0	25.0	26.2	27.4	28.6	29.8	31.0	32.1
40	3- 8	12.8	14.0	15.3	16.5	17.7	18.9	20.1	21.4	22.6	23.8	25.1	26.2	27.4	28.7	30.0	31.2	32.4	33.6
42	3-10	13.4	14.7	16.0	17.3	18.5	19.8	21.0	22.4	23.6	24.9	26.2	27.4	28.6	30.0	31.3	32.6	33.8	35.0
44	4- 0	14.0	15.3	16.7	18.0	19.3	20.7	22.0	23.4	24.6	26.0	27.3	28.6	30.0	31.3	32.6	34.0	35.3	36.5
46	4- 2	14.6	16.0	17.4	18.8	20.1	21.5	23.0	24.4	25.6	27.1	28.4	29.8	31.2	32.6	34.0	35.5	36.8	38.2
48	4- 4	15.2	16.6	18.0	19.5	20.9	22.4	23.8	25.3	26.7	28.1	29.5	31.0	32.4	34.0	35.4	36.8	38.3	39.6
50	4- 6	15.7	17.2	18.7	20.3	21.8	23.2	24.8	26.2	27.7	29.2	30.7	32.2	33.7	35.2	36.7	38.2	39.7	41.2
52	4- 8	16.3	17.9	19.4	21.0	22.5	24.0	25.6	27.2	28.7	30.3	31.8	33.4	35.0	36.5	38.0	39.6	41.2	42.7
54	4-10	16.9	18.5	20.1	21.8	23.4	25.0	26.6	28.2	29.8	31.4	32.9	34.6	36.2	37.8	39.5	41.0	42.7	44.3
56	5- 0	17.5	19.3	20.8	22.5	24.2	25.8	27.5	29.0	30.8	32.5	34.0	35.8	37.5	39.8	40.8	42.5	44.2	46.0

Table of Square Feet of Wall Surface ordinarily found in House Heating

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Height of Ceiling	RUNNING FEET OF EXPOSED WALL WITHOUT REGARD TO WINDOW OPENINGS																		
	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
8	48	56	64	72	80	88	96	104	112	120	128	136	144	152	160	168	176	184	192
8½	51	60	68	76	85	94	102	110	119	127	136	145	153	162	170	178	187	195	204
9	54	63	72	81	90	99	108	117	126	135	144	153	162	171	180	189	198	207	216
9½	57	66	76	86	95	105	114	123	133	142	152	161	171	181	190	200	209	218	228
10	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200	210	220	230	240
10½	63	73	84	94	105	115	126	136	147	157	168	178	189	199	210	220	231	242	252
11	66	77	88	99	110	121	132	143	154	165	176	187	198	209	220	231	242	253	264
11½	69	80	92	104	115	126	138	149	161	172	184	195	207	218	230	241	253	265	276
12	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240	252	264	276	288
12½	75	87	100	112	125	137	150	162	175	187	200	212	225	238	250	262	275	287	300
13	78	91	104	117	130	143	156	169	181	195	208	221	234	247	260	273	286	299	312
14	84	98	112	126	140	154	168	182	196	210	224	238	252	266	280	294	308	322	336
Height of Ceiling	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
8	200	208	216	224	232	240	248	256	264	272	280	288	296	304	312	320	328	336	344
8½	212	221	230	238	246	255	263	272	280	289	298	306	315	323	332	340	349	357	366
9	225	234	243	252	261	270	279	288	297	306	315	324	333	342	351	360	369	378	387
9½	237	247	256	266	275	285	294	304	313	323	332	342	351	361	370	380	389	399	408
10	250	260	270	280	290	300	310	320	330	340	350	360	370	380	390	400	410	420	430
10½	262	273	283	294	305	315	325	336	346	357	367	378	388	399	409	420	430	441	451
11	275	286	297	308	319	330	341	352	363	374	385	396	407	418	429	440	451	462	473
11½	287	299	310	322	333	345	356	368	379	391	403	414	426	437	449	460	471	483	494
12	300	312	324	336	348	360	372	384	396	408	420	432	444	456	468	480	492	504	516
12½	312	325	337	350	362	375	387	400	412	425	437	450	462	475	487	500	512	525	537
13	325	338	351	364	377	390	403	416	429	442	455	468	481	494	507	520	533	546	559
14	350	364	378	392	406	420	434	448	462	476	490	504	518	532	546	560	574	588	602

SURFACE AREA OF PIPE

External Surface of Various Sizes and Lengths of Pipe.

Length of Pipe	Size of Pipe—inches,—Area sq. ft.											
	¾	1	1¼	1½	2	2½	3	4	5	6	7	8
1	.275	.346	.434	.494	.622	.753	.916	1.175	1.455	1.739	1.996	2.257
2	.5	.7	.9	1.	1.2	1.5	1.8	2.4	2.9	3.5	4.	4.5
3	.8	1.	1.3	1.5	1.9	2.3	2.7	3.5	4.4	5.2	6.	6.8
4	1.1	1.4	1.7	2.	2.5	3.	3.6	4.7	5.8	7.	8.	9.
5	1.4	1.7	2.2	2.4	3.1	3.8	4.6	5.8	7.3	7.7	10.	11 3
6	1.6	2.1	2.6	2.9	3.7	4.5	5.5	7.	8.7	10.5	12.	13.5
7	1.9	2.4	3.	3.4	4.4	5.3	6.4	8.2	10.2	12.1	14.	15.8
8	2.2	2.8	3.5	3.9	5.	6.	7.3	9.4	11.6	13.9	16.	18.
9	2.5	3.1	3.9	4.4	5.6	6.8	8.2	10.6	13.1	15.7	18.	20.3
10	2.7	3.5	4.3	4.9	6.2	7.5	9.1	11.8	14.6	17.4	20.	22.6
11	3.	3.8	4.8	5.4	6.8	8.3	10.	12.9	16.	19.1	22.	24.9
12	3.3	4.1	5.2	5.9	7.5	9.	11.	14.1	17.4	20.9	24.	27.1
13	3.6	4.5	5.6	6.4	8.1	9.8	11.9	15.3	18.9	22.6	26.	29.4
14	3.8	4.8	6.1	6.9	8.7	10.5	12.8	16.5	20.3	24.3	28.	31.6
15	4.1	5.2	6.5	7.4	9.3	11.3	13.7	17.6	21.8	26.1	30.	33.9
16	4.4	5.5	6.9	7.9	10.	12.	14.6	18.8	23.2	27.8	32.	36.1
17	4.7	5.9	7.4	8.4	10.6	12.8	15.5	20.	24.7	29.5	34.	38.4
18	5.	6.2	7.8	8.9	11.2	13.5	16.5	21.2	26.2	31.3	36.	40.6
19	5.2	6.6	8.3	9.4	11.8	14.3	17.4	22.3	27.6	33.1	38.	42.9
20	5.5	6.9	8.7	9.9	12.5	15.	18.3	23.5	29.1	34.8	40.	45.2
21	5.8	7.3	9.1	10.4	13.	15.8	19.2	24.7	30.5	36.5	42.	47.4
22	6.	7.6	9.6	10.9	13.7	16.5	20.2	25.9	32.	38.3	44.	49.7
23	6.3	8.	10.	11.3	14.3	17.3	21.1	27.	33.5	40.	46.	52.
24	6.6	8 3	10.4	11.9	14.9	18.	22.	28.2	34.9	41.7	48.	54.2
25	6.9	8.6	10.9	12.3	15.6	18.8	22.9	29.3	36.3	43.5	50.	56.4
26	7.1	9.	11.3	12.8	16.2	19.5	23.8	30.5	37.8	45.2	52.	58.6
27	7.4	9.4	11.7	13.3	16.8	20.3	24.7	31.7	39.3	47.	54.	61.
28	7.7	9.7	12.2	13.8	17.4	21.	25.6	32.9	40.7	48.7	56.	63.2
29	8.	10.	12.6	14.3	18.	21.8	26.6	34.1	42.2	50.4	58.	65.5
30	8.3	10.4	13.	14.8	18.7	22.5	27.5	35.3	43.6	52.1	60.	67.7
31	8.5	10.7	13.5	15.3	19.3	23.3	28.4	36.4	45.1	53.9	62.	70.
32	8.8	11.1	13.9	15.8	19.9	24.1	29.3	37.6	46.5	55.6	64.	72.2
33	9.1	11.4	14.3	16.3	20.5	24.8	30.2	38.8	48.	57.4	66.	74.4
34	9.4	11.7	14.7	16.8	21.2	25.6	31.1	40.	49.5	59.1	68.	76.7
35	9.6	12.1	15.2	17.3	21.8	26.3	32.	41.1	50.9	60.8	70.	79.
36	9.9	12.5	15.6	17.8	22.4	27.	33.	42.3	52.4	62.6	72.	81.3
37	10.2	12.8	16.1	18.3	23.	27.8	33.9	43.5	53.8	64.3	74.	83.5
38	10.5	13.2	16.5	18.8	23.7	28.5	34.8	44.6	55.2	66.	76.	85.8
39	10.7	13.5	16.9	19.3	24.3	29.3	35.7	45.8	56.7	67.8	78.	88.
40	11.	13.8	17.4	19.8	24.9	30.1	36.6	47.	58.2	69.5	80.	90.2
41	11.3	14.2	17.8	20.3	25.5	30.8	37.6	48.2	59.6	71.3	82.	92.5
42	11.5	14.5	18.2	20.8	26.1	31.6	38.5	49.4	61.1	73.	84.	94.8
43	11.8	14.9	18.7	21.3	26.8	32.3	39.4	50.6	62.5	74.8	86.	97.
44	12.1	15.2	19.1	21.8	27.4	33.1	40.3	51.7	64.	76.5	88	99.3
45	12.4	15.6	19.5	22.2	28.	33.8	41.2	52.9	65.5	78.2	90.	101.6
46	12.7	15.9	20.	22.7	28.6	34.6	42.2	54.	67.	80.	92.	103.8
47	12.9	16.3	20.4	23.2	29.2	35.3	43.	55.2	68.4	81.7	94.	106.
48	13.2	16.6	20.8	23.7	29.9	36.1	43.9	56.4	69.8	83.5	96.	108.4
49	13.5	17.	21.3	24.2	30.5	36.8	44.8	57.6	71.2	85.1	98.	110.5
50	13.8	17.3	21.7	24.7	31.1	37.6	45.8	58.7	72.7	87.	100.	112.8

Note—Above information is quoted from standard authorities. Not guaranteed.

EQUALIZATION OF PIPE AREAS

(Babcock and Wilcox)

* Diam. of Pipes, Ins.	Number of Smaller Pipes Equivalent to One Larger Pipe					
	¾ Inch	1 Inch	1½ Inch	2 Inch	3 Inch	4 Inch
½	2.27	4.88	15.8	31.7	96.9	205
¾	1	2.05	6.9	14	42.5	90.4
1	....	1	3.5	6.8	20.9	44.1
1½	....	....	1	1.3	6.1	13
2	....	....	....	1	3.1	6.5
2½	....	....	....	....	1.8	3.87
3	....	....	....	....	1	2.12
4	....	....	....	....	....	1
5	....	....	....	....	....	....
6	....	....	....	....	....	....
7	....	....	....	....	....	....
8	....	....	....	....	....	....

* Diam. of Pipes, Ins.	Number of Smaller Pipes Equivalent to One Larger Pipe					
	5 Inch	6 Inch	7 Inch	8 Inch	9 Inch	10 Inch
½	377	620	918	.....	.....	.....
¾	166	273	405	569	779	.....
1	81.1	133	198	278	380	536
1½	23.8	39.2	58.1	81.7	112	157
2	11.9	19.6	29.0	40.8	55.8	78.5
2½	7.1	11.7	17.4	24.4	33.4	47.0
3	3.9	6.4	9.5	13.3	20.9	23.7
4	1.8	3	4.5	6.3	8.6	12.1
5	1	1.6	2.4	3.4	4.7	6.6
6	.....	1	1.5	2.1	2.8	4.0
7	.....	.....	1	1.4	1.9	2.7
8	.....	.....	.....	1	1.3	1.9

*Nominal diameters standard steam- and gas-pipes.

Example

To find number of 2-inch pipes which will deliver as much fluid as one 5-inch pipe: In column headed 5, and opposite 2 read 11.9 which is the equivalent number of 2-inch pipes.

Wrought Iron Welded Steam, Gas and Water Pipe

Table of Standard Dimensions

Diameter			Thickness	Circumference		Transverse Areas			Length of Pipe per Sq. Ft. of		Length of Pipe Containing One Cubic Foot	Nominal Weight per Foot	Number of Threads per Inch of Screw	Tap Drill
Nominal Internal	Actual External	Actual Internal		External	Internal	External	Internal	Metal	External Surface	Internal Surface				
Inches	Inches	Inches	Inches	Inches	Inches	Sq. In.	Sq. In.	Sq. In.	Feet	Feet	Feet	Lbs.		
1/8	0.405	0.27	0.068	1.272	0.848	0.129	0.0573	0.0717	9.44	14.15	2513.	0.241	27	11/32
1/4	0.54	0.364	0.088	1.696	1.144	0.229	0.1041	0.1249	7.075	10.49	1383.3	0.42	18	7/16
3/8	0.675	0.494	0.091	2.121	1.552	0.358	0.1917	0.1663	5.657	7.73	751.2	0.559	18	9/16
1/2	0.84	0.623	0.109	2.639	1.957	0.554	0.3048	0.2492	4.547	6.13	472.4	0.837	14	11/16
3/4	1.05	0.824	0.113	3.299	2.589	0.866	0.5333	0.3327	3.637	4.635	270.	1.115	14	15/16
1	1.315	1.048	0.134	4.131	3.292	1.358	0.8626	0.4954	2.904	3.645	166.9	1.668	11 1/2	1 3/16
1 1/4	1.66	1.38	0.14	5.215	4.335	2.164	1.496	0.668	2.301	2.768	96.25	2.244	11 1/2	1 1/2
1 1/2	1.9	1.611	0.145	5.969	5.061	2.835	2.038	0.797	2.01	2.371	70.66	2.678	11 1/2	1 3/4
2	2.375	2.067	0.154	7.461	6.494	4.43	3.356	1.074	1.608	1.848	42.91	3.609	11 1/2	2 1/4
2 1/2	2.875	2.468	0.204	9.032	7.753	6.492	4.784	1.708	1.328	1.547	30.1	5.739	8	2 11/16
3	3.5	3.067	0.217	10.996	9.636	9.621	7.388	2.243	1.091	1.245	19.5	7.536	8	3 5/16
3 1/2	4.	3.548	0.226	12.566	11.146	12.566	9.887	2.679	0.955	1.077	14.57	9.001	8	3 13/16
4	4.5	4.026	0.237	14.137	12.648	15.904	12.73	3.174	0.849	0.949	11.31	10.665	8	4 5/16
4 1/2	5.	4.508	0.246	15.708	14.162	19.635	15.961	3.674	0.764	0.848	9.02	12.34	8	...
5	5.563	5.045	0.259	17.477	15.849	24.306	19.99	4.316	0.687	0.757	7.2	14.502	8	...
6	6.625	6.065	0.28	20.813	19.054	34.472	28.888	5.584	0.577	0.63	4.98	18.762	8	...
7	7.625	7.023	0.301	23.955	22.063	45.664	38.738	6.926	0.501	0.544	3.72	23.271	8	...
8	8.625	7.982	0.322	27.096	25.076	58.426	50.04	8.386	0.443	0.478	2.88	28.177	8	...
9	9.625	8.937	0.344	30.238	28.076	72.76	62.73	10.03	0.397	0.427	2.29	33.701	8	...
10	10.75	10.019	0.366	33.772	31.477	90.763	78.839	11.924	0.355	0.382	1.82	40.065	8	...

AREAS OF CIRCLES

Dia.	Area	Dia.	Area	Dia.	Area	Dia.	Area
⅛	0.0123	10	78.54	30	706.86	65	3318.3
¼	0.0491	½	86.59	31	754.76	66	3421.2
⅜	0.1104	11	95.03	32	804.24	67	3525.6
½	0.1963	½	103.86	33	855.30	68	3631.6
⅝	0.3067	12	113.09	34	907.92	69	3739.2
¾	0.4417	½	122.71	35	962.11	70	3848.4
⅞	0.6013	13	132.73	36	1017.8	71	3959.2
1	0.7854	½	143.13	37	1075.2	72	4071.5
⅛	0.9940	14	153.93	38	1134.1	73	4185.3
¼	1.227	½	165.13	39	1194.5	74	4300.8
⅜	1.484	15	176.71	40	1256.6	75	4417.8
½	1.767	½	188.69	41	1320.2	76	4536.4
⅝	2.073	16	201.06	42	1385.4	77	4656.0
¾	2.405	½	213.82	43	1452.2	78	4778.3
⅞	2.761	17	226.98	44	1520.5	79	4901.6
2	3.141	½	240.52	45	1590.4	80	5026.5
¼	3.976	18	254.46	46	1661.9	81	5153.0
½	4.908	½	268.80	47	1734.9	82	5281.0
¾	5.939	19	283.52	48	1809.5	83	5410.6
3	7.068	½	298.64	49	1885.7	84	5541.7
¼	8.295	20	314.16	50	1963.5	85	5674.5
½	9.621	½	330.06	51	2042.8	86	5808.8
¾	11.044	21	346.36	52	2123.7	87	5944.6
4	12.566	½	363.05	53	2206.1	88	6082.1
½	15.904	22	380.13	54	2290.2	89	6221.1
5	19.635	½	397.60	55	2375.8	90	6361.7
½	23.758	23	415.47	56	2463.0	91	6503.8
6	28.274	½	433.73	57	2551.7	92	6647.6
½	33.183	24	452.39	58	2642.0	93	6792.9
7	38.484	½	471.43	59	2733.9	94	6939.7
½	44.178	25	490.87	60	2827.4	95	7088.2
8	50.265	26	530.93	61	2922.4	96	7238.2
½	56.745	27	572.55	62	3019.0	97	7389.8
9	63.617	28	615.75	63	3117.2	98	7542.9
½	70.882	29	660.52	64	3216.9	99	7697.7

To find the area of a circle when diameter is given, multiply the square of the diameter by .7854.

CIRCUMFERENCE OF CIRCLES

Diam.	Circum-ference	Diam.	Circum-ference	Diam.	Circum-ference	Diam.	Circum-ference
1/8	.3927	10	31.416	30	94.248	65	204.204
1/4	.7854	1/2	32.987	31	97.389	66	207.345
3/8	1.1781	11	34.558	32	100.531	67	210.487
1/2	1.5708	1/2	36.128	33	103.673	68	213.628
5/8	1.9635	12	37.699	34	106.814	69	216.770
3/4	2.3562	1/2	39.270	35	109.956	70	219.911
7/8	2.7489	13	40.841	36	113.097	71	223.053
1	3.1416	1/2	42.412	37	116.239	72	226.195
1/8	3.5343	14	43.982	38	119.381	73	229.336
1/4	3.9270	1/2	45.553	39	122.522	74	232.478
3/8	4.3197	15	47.124	40	125.664	75	235.619
1/2	4.7124	1/2	48.695	41	128.805	76	238.761
5/8	5.1051	16	50.265	42	131.947	77	241.903
3/4	5.4978	1/2	51.836	43	135.088	78	245.044
7/8	5.8905	17	53.407	44	138.230	79	248.186
2	6.2832	1/2	54.978	45	141.372	80	251.327
1/4	7.0686	18	56.549	46	144.513	81	254.469
1/2	7.8540	1/2	58.119	47	147.655	82	257.611
3/4	8.6394	19	59.690	48	150.796	83	260.752
3	9.4248	1/2	61.261	49	153.938	84	263.894
1/4	10.210	20	62.832	50	157.080	85	267.035
1/2	10.996	1/2	64.403	51	160.221	86	270.177
3/4	11.781	21	65.973	52	163.363	87	273.319
4	12.566	1/2	67.544	53	166.504	88	276.460
1/2	14.137	22	69.115	54	169.646	89	279.602
5	15.708	1/2	70.686	55	172.788	90	282.743
1/2	17.279	23	72.257	56	175.929	91	285.885
6	18.850	1/2	73.827	57	179.071	92	289.027
1/2	20.420	24	75.398	58	182.212	93	292.168
7	21.991	1/2	76.969	59	185.354	94	295.310
1/2	23.562	25	78.540	60	188.496	95	298.451
8	25.133	26	81.681	61	191.637	96	301.593
1/2	26.704	27	84.823	62	194.779	97	304.734
9	28.274	28	87.965	63	197.920	98	307.876
1/2	29.845	29	91.106	64	201.062	99	311.018

To find the circumference of a circle when diameter is given, multiply the given diameter by 3.1416.

U. S. Standard Gage for Sheet and Plate Iron and Steel.

Number of Gauge	Approximate Thickness in Fractions of an Inch	Approximate Thickness in Decimal Parts of an Inch	Approximate Thickness in Millimeters	Weight per Square Foot in Ounces Avoirdupois	Weight per Square Foot in Pounds Avoirdupois	Weight per Square Foot in Kilograms	Weight per Square Meter In Kilograms	Weight per Square Meter in Pounds Avoirdupois
0000000	1-2	0.5	12.7	320	20.	9.072	97.65	215.28
000000	15-32	0.46875	11.90625	300	18.75	8.505	91.55	201.82
000000	7-16	0.4375	11.1125	280	17.50	7.938	85.44	188.37
0000	13-32	0.40625	10.31875	260	16.25	7.371	79.33	174.91
000	3-8	0.375	9.525	240	15.	6.804	73.24	161.46
00	11-32	0.34375	8.73125	220	13.75	6.237	67.13	148.00
0	5-16	0.3125	7.9375	200	12.50	5.67	61.03	134.55
1	9-32	0.28125	7.14375	180	11.25	5.103	54.93	121.09
2	17-64	0.265625	6.746875	170	10.625	4.819	51.88	114.37
3	1-4	0.25	6.35	160	10.	4.536	48.82	107.64
4	15-64	0.234375	5.953125	150	9.375	4.252	45.77	100.91
5	7-32	0.21875	5.55625	140	8.75	3.969	42.72	94.18
6	13-64	0.203125	5.159375	130	8.125	3.685	39.67	87.45
7	3-16	0.1875	4.7625	120	7.5	3.402	36.62	80.72
8	11-64	0.171875	4.365625	110	6.875	3.118	33.57	74.00
9	5-32	0.15625	3.96875	100	6.25	2.835	30.52	67.27
10	9-64	0.140625	3.571875	90	5.625	2.552	27.46	60.55
11	1-8	0.125	3.175	80	5.	2.268	24.41	53.82
12	7-64	0.109375	2.778125	70	4.375	1.984	21.36	47.09
13	3-32	0.09375	2.38125	60	3.75	1.701	18.31	40.36
14	5-64	0.078125	1.984375	50	3.125	1.417	15.26	33.64
15	9-128	0.0703125	1.7859375	45	2.8125	1.276	13.73	30.27
16	1-16	0.0625	1.5875	40	2.5	1.134	12.21	26.91
17	9-160	0.05625	1.42875	36	2.25	1.021	10.99	24.22
18	1-20	0.05	1.27	32	2.	0.9072	9.765	21.53
19	7-160	0.04375	1.11125	28	1.75	0.7938	8.544	18.84
20	3-80	0.0375	0.9525	24	1.50	0.6804	7.324	16.15
21	11-320	0.034375	0.873125	22	1.375	0.6237	6.713	14.80
22	1-32	0.03125	0.793750	20	1.25	0.567	6.103	13.46
23	9-320	0.028125	0.714375	18	1.125	0.5103	5.49	12.11
24	1-40	0.025	0.635	16	1.	0.4536	4.882	10.76
25	7-320	0.021875	0.555625	14	0.875	0.3969	4.272	9.42
26	3-160	0.01875	0.47625	12	0.75	0.3402	3.662	8.07
27	11-640	0.0171875	0.4365625	11	0.6875	0.3119	3.357	7.40
28	1-64	0.015625	0.396875	10	0.625	0.2835	3.052	6.73
29	9-640	0.0140625	0.3571875	9	0.5625	0.2551	2.746	6.05
30	1-80	0.0125	0.3175	8	0.5	0.2268	2.441	5.38
31	7-640	0.0109375	0.2778125	7	0.4375	0.1984	2.136	4.71
32	13-1280	0.01015625	0.25796875	6½	0.40625	0.1843	1.983	4.37
33	3-320	0.009375	0.238125	6	0.375	0.1701	1.831	4.04
34	11-1280	0.00859375	0.21828125	5½	0.34375	0.1559	1.678	3.70
35	5-640	0.0078125	0.1984375	5	0.3125	0.1417	1.526	3.36
36	9-1280	0.00703125	0.17859375	4½	0.28125	0.1276	1.373	3.03
37	17-2560	0.00664062	0.16867187	4¼	0.26562	0.1205	1.297	2.87
38	1-160	0.00625	0.15875	4	0.25	0.1134	1.221	2.69

METRIC AND ENGLISH MEASURES

Measures of Length

Metric			English	
1	metre	=	39.37	inches
			3.28	feet
.3048	metre	=	1	foot
1	centimetre	=	.3937	inch
2.54	centimetres	=	1	inch
1	millimetre	=	.03937	inch (1-25 inch, nearly)
25.4	millimetres	=	1	inch
1	kilometre	=	1093.61	yards

Measures of Surface

1	square metre	=	10.764	square feet
.0929	square metre	=	1	square foot
1	square centimetre	=	.155	square inch
6.452	square centimetres	=	1	square inch
1	square millimetre	=	.00155	square inch
645.2	square millimetres	=	1	square inch

Measures of Volume

1	cubic metre	=	35.314	cubic feet
.02832	cubic metre	=	1	cubic foot
1	cubic decimetre	=	61.023	cubic inches
			.0353	cubic foot
28.32	cubic decimetres	=	1	cubic foot
16.387	cubic centimetres	=	1	cubic inch
1	cubic centimetre	=	.061	cubic inch

Measures of Capacity

1	litre = 1 cubic decimetre	=	61.023	cubic inches
			.0353	cubic foot
			.2202	gallon (Imperial)
			2.202	pounds of water at 62 degrees Fahr.
28.317	litres	=	1	cubic foot (6.25 Imperial gallons)
4.543	litres	=	1	gallon (Imperial)
3.785	litres	=	1	gallon (American)

Measures of Weight

Metric			English	
28.35	grammes	=	1	ounce avoirdupois
1	kilogramme	=	2.2046	pounds
.4536	kilogramme	=	1	pound
1 metric ton / 1000 kilogrammes		=	.9842	ton of 2240 pounds, or
			19.68	cwts. or 2204.6 lbs.
1.016 metric tons / 1016 kilogrammes		=		1 ton of 2240 pounds

Miscellaneous

1	gramme per square millimetre	=	1.422	lbs. per square inch
1	kilogramme per square millimetre	=	1422.32	lbs. per square inch
1	kilogramme per square centimetre	=	14.233	lbs. per square inch
1.0335	kg. per sq. centimetre 1 atmosphere	=	14.7	lbs. per square inch
0.070308	kilogramme per square centimetre	=	1	lb. per square inch

METRIC AND ENGLISH MEASURES

Measures of Pressure and Weight

1 lb. per square inch............=	144	lbs. per square foot
	2.0355	inches of mercury at 32 degrees Fahr.
	2.0416	inches of mercury at 62 degrees Fahr.
	2.309	ft. of water at 62 degrees Fahr.
	27.71	inches of water at 62 degrees Fahr.
1 Atmosphere (14.7 lbs. per sq. in.)=	2116.3	lbs. per square foot
	33.947	ft. of water at 62 degrees Fahr.
	30	inches of mercury at 62 degrees Fahr.
	29.929	inches of mercury at 32 degrees Fahr.
	760	millimetres of mercury at 32 degrees Fahr.
1 Foot of Water at 62 degrees Fahr.=	.433	lbs. per square inch
	62.355	lbs. per square foot
1 Inch of Mercury at 62 degrees Fahr.......................=	.491	lb. or 7.86 oz. per sq. in.
	1.132	ft. of water at 62 degrees Fahr.
	13.58	inches of water at 62 degrees Fahr.

Weight of One Cubic Foot of Pure Water

At 32 degrees Fahr. (freezing point).....................62.418 lbs.
At 39.1 degrees Fahr. (maximum density)...............62.425 lbs.
At 62 degrees Fahr. (standard temperature).............62.355 lbs.
At 212 degrees Fahr. (boiling point, under 1 atmosphere)...59.76 lbs.
Imperial gallon=277.274 cubic inches of water at 62 degrees Fahr...=10 lbs.
American gallon=231 cubic inches of water at 62 degrees Fahr...=8.3356 lbs.

General Data

1 Calorie......................=	3.968	B. t. u.
1 B. t. u......................=	0.252	Calorie
1 lb. per sq. in^2 ....=	703.08	kilogrammes per m^2
1 Kilogramme per m^2 ....=	.00142	lbs. per sq. in
1 Calorie per m^2...............=	.3687	B. t. u. per sq. ft.
1 B. t. u. per sq. ft..............=	2.712	calories per m^2
1 Calorie per m^2 per degree difference Cent......... =	.2048	B. t. u. per sq. ft. per degree difference Fahr.
1 B. t. u. per sq. ft. per degree difference Fahr........... =	4.882	Calories per m^2 per degree difference Cent.
1 B. t. u. per lb.................=	.556	Calories per kilog.
1 Calorie per kilog...............=	1.8	B. t. u. per lb.
Water expands in bulk from 40 degrees to 212 degrees............=		One twenty-third.

A cubic inch of water evaporated under ordinary atmospheric pressure is converted into 1 cubic foot of steam (approximately).

Specific Heat of Various Substances

Water	1.0000	Birch	0.4800
Air	0.2375	Oak	0.5700
Oxygen	0.2175	Plaster	0.2000
Nitrogen	0.2438	Glass	0.1937
Hydrogen	3.4090	Brickwork	0.1950
Coal	0.2777	Masonry	0.2159
Coke	0.2010	Cast Iron	0.1298
Petroleum	0.4340	Wrought Iron	0.1138
Pine	0.4670	Steel (soft)	0.1165

Weights

1 cubic inch of Cast Iron	weighs	0.260	pounds
1 cubic inch of Wrought Iron	weighs	0.280	pounds
1 cubic inch of Water	weighs	0.036	pounds
1 U. S. Gallon	weighs	8.330	pounds
1 Imperial Gallon	weighs	10.000	pounds
1 U. S. Gallon	equals	231.000	cubic inches
1 Imperial Gallon	equals	277.274	cubic inches
1 cubic foot of Water	equals	7.480	U. S. gallons
1 pound of Steam	equals	27.222	cubic feet
1 pound of Air	equals	13.817	cubic feet

Measure of Solidity

1728 cubic inches = 1 cubic foot
27 cubic feet = 1 cubic yard

Liquid Measure

4 gills make 1 pint
2 pints make 1 quart
4 quarts make 1 gallon
31½ gallons make 1 barrel

Boiling Points of Various Fluids

	Degrees		Degrees
Water, Atmospheric Pressure	212	Refined Petroleum	316
Alcohol	173	Turpentine	315
Sulphuric Acid	240	Sulphur	570
		Linseed Oil	597

Melting Points of Different Metals

	Degrees		Degrees
Aluminum	1400	Iron (cast)	2450
Antimony	810	Iron (wrought)	2912
Bismuth	476	Lead	608
Brass	1900	Platinum	3080
Bronze	1692	Silver (pure)	1873
Copper	1996	Steel	2500
Glass	2377	Tin	446
Gold (pure)	2590	Zinc	680

Note.—Above information is quoted from standard authorities Not guaranteed.

CLASSIFIED TELEGRAPH CODE

GENERAL CODE

Quotations and Correspondence

	Code Word
Advise if you have received shipment	Abaca
Answer by first mail	Abacist
Answering your wire of date the carload rate per cwt. and minimum weight on	Abactor
Answering your wire of date less than carload rate per cwt. on	Abaiser
At what price and how soon can you furnish	Albanga
Change my route to read as follows	Abature
Do not understand the meaning of	Abderite
Factory shipment with regular freight allowance	Abelmosk
Have received no reply to our letter of	Abetment
Have received no reply to our telegram of	Abidance
Have written	Abietic
Immediate specifications, three months' delivery limit	Abjugate
Inclosure mentioned in your letter of....not received, mail same at once	Ableness
In market for	Abluvion
Mail as promptly as possible	Abnodate
Must have information immediately	Abradant
Quote best price on	Abreption
Quote best price on....square feet of standard (38-inch) height of....Radiators	Abscissa
Referring to our letter of	Absenter
Referring to our telegram of	Absinthic
Referring to our order	Absolutist
Referring to telephone conversation of today	Absolver
Referring to your letter of	Abstainer
Referring to your telegram of	Abstruse
Replying to your telephone of (......)	Absurd
See our letter of....giving full particulars	Abyssal
We are mailing today	Acadian
We quote you for immediate acceptance	Acanthus
Will be here until	Acceder
Will be in	Acclimat
Will wire you tomorrow morning	Accolade
Wire credit approval	Accrescent
Wire at once less than carload freight rate on	Accordion
Wire carload freight rate on	Accretion
Wire reply quickly	Accumbent
2½ per cent	Acerose
5 per cent	Acicular
7½ per cent	Acinous
10 per cent	Acoustic

GENERAL CODE

Orders and Shipments

	Code Word
Add to our order (No. or date)........	Babbler
After receipt of order........................	Baboonery
Answering your inquiry, we could promise shipment within.....after receipt of order.	Bacciform
Answering your wire, no record of orders referred to..................................	Bacteria
Answering your wire, route material covered by	Bacillar
Can ship complete your No......immediately except........Shall we make such shipment?................................	Backlog
Can you ship immediately?................	Baconian
Can you ship immediately? If not how soon can you promise shipment?..............	Baculite
Cannot ship immediately but can ship (date).	Bailable
Cannot ship immediately; may we substitute.	Bakehouse
Change our order (No. or date) (to read....	Balanite
Correction notices..........................	Baldness
Could ship immediately.....................	Balkingly
Disregard routing instructions our letter and substitute..................................	Balladry
Do not find any order from you (No. or date).	Ballistic
Do not hold for other orders, but rush quickly	Balmoral
Duplicate our order (No. or date)..........	Baluster
Enter order as per our inquiry.............	Banality
Enter order at your quotation of...........	Bandoleer
Expect to make shipment.................	Banisher
Forward as carload shipment if actual weight of material exceeds........................	Banquet
Forward by express......................	Barbate
Forward by parcel post.....................	Barbe
Forward as less carload shipment..........	Barbaric
Have you shipped our order No......?.....	Barbecue
Hold for instruction order (No. or date).....	Barbicel
How should we handle?.....................	Bareness
If not in stock wire..........................	Bargainer
Include in car now assembling at...........	Baritone
Make proposed shipment order No......... without waiting for......................	Barnacle
Must have immediate shipment Order No...	Barometz
Necessary parts to increase...............	Baroscope
Order No.....has been preferred for shipment..................................	Barricade
Order No.....has not yet been shipped....	Barrowist
Order No..is ready for shipment. We have no car going for.....days. Shall we forward as small lot? If so wire shipping instructions..................................	Bartizan

Orders and Shipments—Continued

	Code Word
Omit.....from our order (No. or date).....	Basaltic
Plant have not sufficient weight for minimum car—lack........pounds—wire additional specifications for minimum car at........ Plant..................................	Bashfully
Referring to your correction notice.........	Basketry
Referring to our order (No. or date)........	Basswood
Referring to your order (No. or date).......	Basylous
See our correction notice..................	Batterer
Send as small lot, unless car going at once...	Bavarian
Send us bill of lading covering our order (No......)............................	Bayberry
Shall we recall?..........................	Beaconage
Ship by best route.........................	Beadwork
Ship by boat.............................	Beamingly
Ship by express...........................	Beastlike
Ship express C. O. D. amount to collect $....	Beautify
Ship by express, prepaid..................	Beddable
Ship by freight...........................	Bedspread
Ship by freight prepaid....................	Befuddle
Ship by Parcel Post........................	Befriend
Ship by same route as our order (No. or date).	Begabble
Ship immediately	Begonia
Ship immediately our order No............	Belonite
Ship in first car to........................	Bendable
Ship what you can at once................	Benedict
Ship with draft and bill of lading attached....	Bengalese
Shipping instructions for order (No. or date) are..................................	Benzoate
To be same pattern as our order No........	Bergamot
Trace at once and advise date of delivery to consignee of material covered by our orders	Berretta
We are forwarding you today our confirming order No..............................	Beverage
We cannot comply with your instructions....	Bewilder
When and by what route did you ship our order	Bibitory
When can you make shipment?.............	Bicaudal
When and from where can you ship?........	Bicameral
When will order (No. or date) be shipped?....	Biferous
When will you have car in which you will include Order No......?.................	Bilander
When will you ship car containing our order?	Billiards
When will you ship car containing requisition No	Billings
Will send shipping instructions by mail......	Bimanous
Wire at once routing our material covered by.	Bindweed

Orders and Shipments—Continued

	Code Word
Wire..........Branch prospects car including Requisitions	Biologist
Wire us car number and initial immediately upon shipment of car	Birthroot
You may substitute on our order (No. or date)	Bitterly
Your order (No. or date) does not specify	Bivalent
Your order (No. or date) was shipped	Bivouac

Manufacturing Plants

Plants	Code Word	Plants	Code Word
Austin Arcola	Cervelat	Kansas City	Chatoyant
Austin Radiator	Cervical	Litchfield	Chevroned
Bayonne	Cetacean	Malleable, Buffalo	Chevey
Birmingham	Chaffinch	Michigan, Detroit	Chivalric
Bond	Chaldrich	Pierce, Buffalo	Chondrite
Brantford, Ont.	Chambered	Standard, Buffalo	Chorister
Detroit	Chantant	Springfield	Chosing
Equipment, Buffalo	Chantecler	Terminal Jacket	Choul
Holland, Bremen, Ind.	Chapelet	Titusville	Chrysene
Houston, Rockford, Ill.	Chattel		

Transportation Lines

	Code Word
Akron, Canton & Youngstown Ry	Dactyl
Alabama Great Southern R. R	Dabbling
Alabama & Vicksburg Ry	Daedalous
Anchor Line	Daintify
Ann Arbor R. R	Dairyman
Atchison, Topeka & Santa Fe Ry	Damascene
Atlanta & West Point R. R	Damourite
Atlanta, Birmingham & Atlantic Ry	Damewort
Atlantic Coast Line R. R	Danburite
Baltimore & Ohio R. R	Dandruff
Bangor & Aroostook R. R	Danseuse
Bessemer & Lake Erie R. R	Dapple
Boston & Albany R. R	Darbyite
Boston & Main R. R	Dartingly
Boyne City, Gaylord & Alpena R. R	Darkening
Buffalo & Susquehanna R. R	Datiscin
Buffalo, Rochester & Pittsburgh Ry	Dashingly
Canadian Northern Ry	Daturine
Canadian Pacific Ry	Dauntless
Carolina, Clinchfield & Ohio Ry	Dauphin
Central New England Ry	Dawsonite

Transportation Lines—Continued

	Code Word
Central of Georgia Ry	Deanship
Central R. R. of New Jersey	Debarment
Central Vermont Ry	Debellate
Charleston & Western Carolina R. R	Debonair
Chesapeake & Ohio Ry	Debutant
Chesapeake & Ohio Ry. of Indiana	Decagram
Chicago & Alton R. R	Defilade
Chicago & Eastern Illinois R. R	Deflorate
Chicago & North-Western Ry	Defrayer
Chicago, Burlington & Quincy R. R	Decanter
Chicago Great Western R. R	Dicennial
Chicago, Indianapolis & Louisville Ry	Decipium
Chicago, Milwaukee & Gary Ry	Decistere
Chicago, Milwaukee & St. Paul Ry	Decorous
Chicago, Peoria & St. Louis R. R	Decostate
Chicago, Rock Island & Pacific Ry	Deerhound
Chicago, St. Paul, Minneapolis & Omaha Ry	Deficate
Chicago, Terre Haute & Southeastern Ry	Deference
Cincinnati, Indianapolis & Western R. R	Defiance
Cincinnati, New Orleans & Texas Pacific R. R	Delphian
Cincinnati Northern R. R	Deltidium
Cleveland & Buffalo Transit Co	Demarcate
Cleveland, Cincinnati, Chicago & St. Louis Ry	Demagogic
Clyde Steamship Co	Demeanor
Coal & Coke R. R	Dementia
Colorado & Southern R. R	Demiurgic
Copper Range R. R	Dempster
Crosby Transportation Co	Demonigan
Cumberland Valley R. R	Demotic
Delaware & Hudson Co	Demurity
Delaware, Lackawanna & Western R. R	Demulsion
Denver & Rio Grande R. R	Denarius
Denver & Salt Lake R. R	Denizen
Detroit & Cleveland Navigation Co	Deniable
Detroit & Mackinac R. R	Denotable
Detroit & Toledo Shore Line R. R	Denseness
Detroit, Toledo & Ironton R. R	Dendrite
Duluth & Iron Range R. R	Dentiform
Duluth, Missabe & Northern Ry	Dentated
Duluth, South Shore & Atlantic Ry	Dentinal
Elgin, Joliet & Eastern Ry	Depascent
El Paso & Southwestern System	Dependant
Erie R. R	Depicture
Florida East Coast Ry	Depilatory

Transportation Lines—Continued

	Code Word
Fort Dodge, Des Moines & Southern R. R.	Deplorable
Ft. Worth & Denver City Ry	Depletory
Galveston, Harrisburg & San Antonio Ry	Deplorer
Georgia R. R	Deponent
Goodrich Transit Co	Depopulate
Grand Rapids & Indiana Ry	Deporture
Grand Trunk Ry	Deputator
Grand Trunk Pacific Ry	Depositor
Great Lakes Transit Corp	Depressor
Great Northern Ry	Deputize
Green Bay & Western R. R	Derivate
Gulf, Colorado & Santa Fe R. R	Dermatine
Hocking Valley Ry	Dermestes
Houston & Texas Central R. R	Derringer
Illinois Central R. R	Derogate
Illinois Traction System	Derworth
Indiana Harbor Belt R. R	Describer
International & Great Northern Ry	Desertful
Kanawha & Michigan Ry	Deshabille
Kansas City, Mexico & Orient R. R	Designer
Kansas City Southern Ry	Desireful
Kewaunee, Green Bay & Western R. R	Detector
Lake Erie & Western R. R	Developer
Lehigh & Hudson River R. R	Dewiness
Lehigh Valley R. R	Dewberry
Lehigh Valley Transportation Line	Devotee
Long Island R. R	Dexterous
Los Angeles & Salt Lake R. R	Dextrine
Louisiana & Arkansas R. R	Dexter
Louisiana Ry. & Nav. Co	Diabase
Louisville & Nashville R. R	Dextronal
Louisville, Henderson & St. Louis R. R	Dextrally
Maine Central R. R	Diaconate
Mallory Steamship Co	Diagraph
Merchants & Miners Transportation Co	Dialectic
Michigan Central R. R	Dialogist
Midland Valley R. R	Dialysis
Mineral Range R. R	Diastase
Minneapolis & St. Louis R. R	Diamonded
Minneapolis, St. Paul & Sault Ste. Marie Ry	Diametral
Missouri, Kansas & Texas Ry	Diandrous
Missouri, Oklahoma & Gulf R. R	Diapason
Missouri Pacific R. R	Diaphane
Mobile & Ohio R. R	Diaphonic
Morgan Line	Dibstone
Morgan's Louisiana & Texas R. R	Dicastery

Transportation Lines—Continued

	Code Word
Nashville, Chattanooga & St. Louis Ry	Didymium
New England Steamship Lines	Diegesis
New Orleans & Northeastern R. R	Dietarian
New Orleans-Great Northern R. R	Dielectric
New York Central Lines	Dietitian
New York, Chicago & St. Louis R. R	Diffident
New York, New Haven & Hartford R. R	Digitalis
New York, Ontario & Western Ry	Dignation
Norfolk & Western Ry	Dignified
Norfolk Southern R. R	Digraph
Northern Pacific Ry	Digonous
Ocean Steamship Line	Digression
Old Dominion Steamship Co	Dihedral
Oregon Short Line R. R	Dilatator
Oregon-Washington R. R. & Navigation Co	Dilection
Pennsylvania Co	Diligency
Pennsylvania R. R. (Eastern Lines)	Dimensive
Pennsylvania R. R. (Western Lines)	Diminish
Pere Marquette Ry	Dimetric
Philadelphia & Reading Ry	Dimissory
Pittsburgh, Cincinnati, Chicago & St. Louis R. R	Dinetical
Pittsburgh & Lake Erie R. R	Dinosaur
Quincy, Omaha & Kansas City R. R	Diocesan
Richmond, Fredericksburg & Potomac R. R	Diogenes
Rutland R. R	Dioptase
St. Joseph & Grand Island R. R	Dioramic
St. Louis-San Francisco R. R	Diplomat
St. Louis Southwestern Ry	Diplanar
Seaboard Air Line Ry	Directive
Southern Pacific Co	Dirigible
Southern Ry	Disabuse
Tennessee Central R. R	Disaffect
Texas & New Orleans R. R	Disburser
Texas & Pacific Ry	Discerner
Toledo & Ohio Central Ry	Discharge
Toledo, Peoria & Western R. R	Disciform
Toledo, St. Louis & Western R. R	Discoidal
Toronto, Hamilton & Buffalo Ry	Discusser
Union Pacific R. R	Disponer
Vicksburg, Shreveport & Pacific Ry	Diurnally
Virginian Ry	Diuretic
Wabash Ry	Divertive
Washington, Baltimore & Annapolis Elec. R. R	Dividend
Washington Southern Ry	Divining

Western & Atlantic Ry	Dogberry
Western Maryland Ry	Dodecane
Western Pacific Ry	Dockyard
West Shore R. R	Dochmius
Wheeling & Lake Erie Ry	Doggerman
White Star Line	Dogmatic
Yazoo & Mississippi Valley R. R	Dolomite
Zanesville & Western R. R	Dolorous

Inches

Inches	Code Word	Inches	Code Word
1/8	Ebullient	4 3/4	Emblazon
1/4	Eburnine	5	Embolite
3/8	Ecboline	5 1/4	Embosser
1/2	Echinate	5 1/2	Emersion
5/8	Echoless	5 3/4	Emigrate
3/4	Ecliptic	6	Eminence
7/8	Ecstatic	6 1/4	Emissary
1	Edelweiss	6 1/2	Emphasis
1 1/8	Edifying	6 3/4	Empirical
1 1/4	Educative	7	Emptiness
1 3/8	Efflation	7 1/4	Emulation
1 1/2	Effusion	7 1/2	Emulsify
1 5/8	Eglantine	7 3/4	Enactment
1 3/4	Egyptian	8	Enchanted
1 7/8	Ejaculate	8 1/4	Encompass
2	Elatedly	8 1/2	Encumber
2 1/4	Elective	8 3/4	Endearing
2 1/2	Elegance	9	Endlessly
2 3/4	Elephant	9 1/4	Enduring
3	Elevated	9 1/2	Energetic
3 1/4	Eligible	9 3/4	Enfilade
3 1/2	Elongate	10	Enlighten
3 3/4	Eloquent	10 1/2	Entangle
4	Elusively	11	Environs
4 1/4	Embarrass	11 1/2	Epicurian
4 1/2	Embellish	12	Equipoise

GENERAL CODE

Time

	Code Word		Code Word
1 day	Fabricate	2 months	Farinose
2 days	Fabulous	3 months	Farmable
3 days	Factioner	4 months	Fashioner
4 days	Factorial	5 months	Fauvette
5 days	Falciform	6 months	Favonion
6 days	Falconer	7 months	Favosites
10 days	Falsetto	8 months	Feathered
1 week	Fanciful	9 months	Federate
2 weeks	Fangless	10 months	Feldspar
3 weeks	Fantistic	11 months	Felicity
1 month	Farcilite	1 year	Fenceless

Dates

In telegraphing dates, prefix the day of the month. For example: "Gabgood" would mean "first day of January."

Date	Code Word	Date	Code Word
1st	Gab	17th	Ger
2d	Gad	18th	Ges
3d	Gah	19th	Gey
4th	Gal	20th	Gib
5th	Gam	21st	Gid
6th	Gar	22d	Gil
7th	Gat	23d	Gof
8th	Gaw	24th	Gol
9th	Geb	25th	Gon
10th	Ged	26th	Gor
11th	Gef	27th	Gow
12th	Geh	28th	Gul
13th	Gel	29th	Gus
14th	Gen	30th	Gyl
15th	Geo	31st	Gym
16th	Gep		

NOTE.—Adding "morn" or "aft" to any of above code words will signify morning or afternoon of any of the dates given. Thus "Gawmorn" will be understood as "the morning of the 8th"; "Gonaft" will signify "the afternoon of the 25th," and so on.

Month	Code Word	Month	Code Word
January	Good	July	Gray
February	Gorge	August	Green
March	Gourd	September	Grill
April	Grade	October	Grove
May	Graff	November	Guard
June	Grass	December	Gulch

GENERAL CODE

Numbers

These figures may be used in giving quantities, order numbers, amounts in dollars, weights, car numbers, etc.

To make a word above 99, use the code as follows: For example, 142—14 hol, 2 hef—"holhef." Or, 1425—14 hol, 25 hus—"holhus". Or, 14,254—14 hol, 25 hus, 4 hek—"holhushek." Or, 142,547—14 hol, 25 hus, 47 ile—"holhusile." Or, say, car number 100,009—10 hex, 00 hac, 09 hec—"hexhachec."

	Code Word		Code Word		Code Word
0	Hab	27	Iba	64	Kab
00	Hac	28	Ibe	65	Kac
01	Haf	29	Ibo	66	Kaf
02	Hak	30	Ibu	67	Kal
03	Hal	31	Ica	68	Kan
04	Han	32	Ico	69	Kap
05	Hap	33	Ide	70	Kar
06	Har	34	Ido	71	Keb
07	Hav	35	Idu	72	Ked
08	Heb	36	Ifa	73	Kef
09	Hec	37	Ife	74	Keh
1	Hed	38	Ifo	75	Kek
2	Hef	39	Iga	76	Kel
3	Heg	40	Ige	77	Kem
4	Hek	41	Igo	78	Kep
5	Hel	42	Iha	79	Kes
6	Hep	43	Iho	80	Ket
7	Hes	44	Ihu	81	Kew
8	Het	45	Iko	82	Kob
9	Hev	46	Ila	83	Kod
10	Hex	47	Ile	84	Koh
11	Hoc	48	Ilo	85	Kol
12	Hof	49	Ima	86	Kom
13	Hok	50	Imo	87	Kon
14	Hol	51	Ina	88	Kos
15	Hom	52	Ine	89	Kov
16	Hon	53	Ino	90	Kub
17	Hos	54	Ipa	91	Kuc
18	Hov	55	Ipo	92	Kud
19	Huc	56	Iqu	93	Kuf
20	Hud	57	Iro	94	Kul
21	Huf	58	Isa	95	Kum
22	Hul	59	Iso	96	Kun
23	Hun	60	Ita	97	Kup
24	Hup	61	Ito	98	Kut
25	Hus	62	Iwa	99	Kuv
26	Hux	63	Iwo		

IDEAL ARCO Round Boiler

(Code Word........Kya)

Steam Boiler No.	Code Word	Water Boiler No.	Code Word
S-1704	Kyabe	W-1704	Kymam
S-1904	Kyaco	W-1904	Kymol
S-2004	Kyads	W-2004	Kymuk
S-2204	Kybac	W-2204	Kynan
S-2504	Kybob	W-2504	Kynom
S-2804	Kybuv	W-2804	Kynug
S-3104	Kycad	W-3104	Kyoba
S-1705	Kycoc	W-1705	Kyoci
S-1905	Kycut	W-1905	Kyodu
S-2005	Kydaf	W-2005	Kypap
S-2205	Kydod	W-2205	Kypon
S-2505	Kydur	W-2505	Kypuf
S-2805	Kyfag	W-2805	Kyrar
S-3105	Kyfof	W-3105	Kyrop
S-1706	Kyfup	W-1706	Kyrud
S-1906	Kygak	W-1906	Kysat
S-2006	Kygog	W-2006	Kysor
S-2206	Kygun	W-2206	Kysuc
S-2506	Kylal	W-2506	Kytav
S-2806	Kylok	W-2806	Kytot
S-3106	Kylum	W-3106	Kytub

IDEAL ARCOLA Heater

(Code Word........Label)

Boiler No.	Code Word
4H	Labent
5H	Labiate
6H	Labile
7H	Laborite
8H	Labras

IDEAL Arcola Heating Outfits

(Code Word.......Laccin)

Outfit No.	Code Word	Outfit No.	Code Word
4H– 75	Lacert	6H–275	Lactam
4H–100	Lache	6H–300	Lacteal
4H–125	Lacing	7H–325	Lactide
4H–150	Lacker	7H–350	Lactum
5H–175	Lacmus	7H–375	Lactone
5H–200	Laconic	8H–400	Lactose
5H–225	Lacquer	8H–425	Lactyl
6H–250	Lactage	8H–450	Lacunal

IDEAL ARCOLA Hot Water Supply Boiler
(Code Word........Ladanum)

Boiler No.	Code Word
3H	Ladder
4H	Laden

IDEAL ARCOLA Hot Water Supply Outfit
(Code Word..........Ladify)

Outfit No.	Code Word	Outfit No.	Code Word
3H-C-52-Black	Ladino	3H-C-52-Galv.	Ladleful
4H-C-100-Black	Ladkin	4H-C-100-Galv.	Ladrone

IDEAL ARCOLA Garage Heating Boiler
(Code Word........Ladybird)

IDEAL ARCOLA Garage Heating Outfit
(Code Word..........Laelaps)

Outfit No.	Code Word
3H-C-36	Laelia
3H-C-72	Laemo
4H-C-36	Laen
4H-C-72	Laeotropic

IDEAL ARCOLA Parlor Heater

Boiler No.	Code Word
40	Laertes
50	Laet
60	Laetic
70	Laetificant

IDEAL ARCOLA Parlor Heating Outfit

Outfit No.	Code Word	Outfit No.	Code Word
A-150-40	Laetitia	A-375-50	Laffitte
A-175-40	Laevigate	A-400-60	Laft
A-200-40	Laevinus	A-425-60	Lag
A-225-40	Laev	A-450-60	Lagado
A-250-40	Lafac	A-475-60	Lagaman
A-275-40	Lafayette	A-500-70	Lagan
A-300-50	Lafed	A-525-70	Lagarto
A-325-50	Laff	A-550-70	Lagena
A-350-50	Lafia		

BOILER CODE

IDEAL Gas ARCOLA Radiator Boiler

Code Word (Natural)..........Lager
Code Word (Artificial)........Laggard

Boiler No.	Code Word (Natural)	Code Word (Artificial)
No. 0	Lagona	Lagmat
No. 1	Lagenian	Lagomorph
No. 2	Lagers	Lagopous
No. 3	Laggart	Lagune
No. 4	Lagging	Laical
No. 5	Lagly	Laicality

IDEAL Gas ARCOLA Heating Outfit

Code Word (Natural).......Laidly
Code Word (Artificial).......Lainere

Outfit No.	Code Word (Natural)	Code Word (Artificial)
1-GA- 75	Laird	Lalo
1-GA-100	Laism	Lamaic
1-GA-125	Laity	Lamaism
1-GA-150	Lakelet	Lamaite
2-GA-175	Lakhma	Lamaistic
2-GA-200	Lakin	Lamantin
2-GA-225	Lakke	Lamark
3-GA-250	Lallation	Lamasery
3-GA-275	Lambale	Lamboys
3-GA-300	Lambaste	Lambre
4-GA-325	Lambative	Lambrequin
4-GA-350	Lambda	Lambskin
4-GA-375	Lambdoid	Lamdoidal
5-GA-400	Lambert	Lame
5-GA-425	Lambkin	Lamel
5-GA-450	Lamblike	Lamellar

IDEAL Gas ARCOLA Hot Water Supply Boiler

Code Word (Natural).......Lamellate
Code Word (Artificial).......Lamelli

Boiler No.	Code Word (Natural)	Code Word (Artificial)
No. 0	Lamely	Lamentable
No. 1	Lameness	Lamenter

IDEAL Gas ARCOLA Hot Water Supply Outfit

Code Word (Natural)........Lames
Code Word (Artificial)........Lametta

Outfit No.	Code Word (Natural)	Code Word (Artificial)
0-Gas- 52-Black	Lamia	Laminaria
0-Gas-100-Black	Laminal	Laminarite
0-Gas- 52-Galv	Laminable	Laminary
0-Gas-100-Galv	Laminal	Lamination

IDEAL Gas ARCOLA Garage Heating Boiler

Code Word (Natural)....Laminiform
Code Word (Artificial)....Laminstis

IDEAL Gas ARCOLA Garage Heating Outfit

Code Word (Natural).....Laminose
Code Word (Artificial)....Lamish

Outfit No.	Code Word (Natural)	Code Word (Artificial)
0-Gas-40	Lampern	Lamiter
0-Gas-75	Lampic	Lamium

IDEAL Smokeless Boilers

Boiler No.	Code Word	Boiler No.	Code Word
S-2906-S	Lamm	W-2906-S	Lampetian
S-2907-S	Lammas	W-2907-S	Lampful
S-2908-S	Lammer	W-2908-S	Lampic
S-2909-S	Lammermoor	W-2909-S	Lamping
S-2910-S	Lammert	W-2910-S	Lampion
S-2911-S	Lammie	W-2911-S	Lampist
S-3607-S	Lammikin	W-3607-S	Lampistry
S-3608-S	Lamming	W-3608-S	Lampless
S-3609-S	Lamnectomy	W-3609-S	Lamplight
S-3610-S	Lamnidae	W-3610-S	Lampong
S-3611-S	Lamnoid	W-3611-S	Lampoon
S-3612-S	Lamoille	W-3612-S	Lampooner
S-3613-S	Lamongan	W-3613-S	Lampoonry
S-3614-S	Lamoni	W-3614-S	Lamprey
S-3615-S	Lamotte	W-3615-S	Lampric

IDEAL Smokeless Boilers—Continued

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
S-4807-S	Lamoure	W-4807-S	Lamproid
S-4808-S	Lamp	W-4808-S	Lamprophane
S-4809-S	Lampad	W-4809-S	Lamprops
S-4810-S	Lampadary	W-4810-S	Lamprotype
S-4811-S	Lampadist	W-4811-S	Lampacen
S-4812-S	Lampadite	W-4812-S	Lampsacus
S-4813-S	Lampadrome	W-4813-S	Lampsana
S-4814-S	Lampas	W-4814-S	Lampsilus
S-7909-S	Lampate	W-7909-S	Lampt
S-7910-S	Lampblack	W-7910-S	Lampwick
S-7911-S	Lampedusa	W-7911-S	Lamuel
S-7912-S	Lamper	W-7912-S	Lamus
S-7913-S	Lampreel	W-7913-S	Lana
S-7914-S	Lamperina	W-7914-S	Lanahan
S-7915-S	Lampern	W-7915-S	Lanark
S-7916-S	Lampet	W-7916-S	Lanarkite
S-7917-S	Lampeter	W-7917-S	Lanarkshire

IDEAL Type "A" Boilers

(Code Word..........Lanary)

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
1-A-4	Lanate	1-A-40	Lapwing
1-A-5	Lancegay	1-A-50	Larboard
1-A-6	Lancet	1-A-60	Larceny
1-A-7	Lancewood	1-A-70	Lardaceous
2-A-5	Lanching	2-A-50	Larkspur
2-A-6	Lanciform	2-A-60	Lasket
2-A-7	Lancinate	2-A-70	Lassitude
2-A-8	Landau	2-A-80	Latchet
2-A-9	Landfall	2-A-90	Laterad
3-A-5	Landlord	3-A-50	Lattice
3-A-6	Langua	3-A-60	Laudable
3-A-7	Lantern	3-A-70	Laughter
3-A-8	Lanyard	3-A-80	Laudanum
3-A-9	Lapful	3-A-90	Launching
3-A-10	Lapidist	3-A-100	Laund
3-A-11	Lappet	3-A-110	Launder

BOILER CODE

IDEAL Type "A" Heat Machine

(Code Word..........Laundress)

Steam		Water	
S-2203-A	Laundry	W-2203-A	Laurite
S-2204-A	Laura	W-2204-A	Laurium
S-2205-A	Laurate	W-2205-A	Laurone
S-2206-A	Laurel	W-2206-A	Laurus
S-2207-A	Laurelic	W-2207-A	Laurustine
S-2208-A	Laurene	W-2208-A	Laurylene
S-2209-A	Laurent	W-2209-A	Laus
S-3205-A	Laurestine	W-3205-A	Lausanne
S-3206-A	Lauret	W-3206-A	Lautite
S-3207-A	Lauric	W-3207-A	Lautu
S-3208-A	Laurin	W-3208-A	Lauwine
S-3209-A	Laurinda	W-3209-A	Lav
S-3210-A	Laurinol	W-3210-A	Lava
S-3211-A	Laurionite	W-3211-A	Lavabo
S-3212-A	Lauristic	W-3212-A	Lavaca

IDEAL Type "C" Boilers

(Code Word..........Laurentian)

Steam Boiler No.	Code Word	Water Boiler No.	Code Word
1-C-4	Lavatate	1-C-40	Leading
1-C-5	Lavender	1-C-50	League
1-C-6	Lavishment	1-C-60	Leakette
1-C-7	Lawfulite	1-C-70	Leasehold
1-C-8	Laxitate	1-C-80	Leaven
1-C-9	Laymat	1-C-90	Lactern
1-C-10	Lazar	1-C-100	Ledger

IDEAL Gas Boiler

Code Word (Natural)..........Leod
Code Word (Artificial)..........Leonced

Steam

Boiler No.	Code Word (Natural)	Code Word (Artificial)
2-G-3	Leonese	Lepas
2-G-4	Leonid	Lepers
2-G-5	Leonine	Lepid
2-G-6	Leonkan	Lepidine
2-G-7	Leopard	Lepidote
2-G-8	Lepace	Lepisma
2-G-9	Lepadite	Lepismoid
2-G-10	Lepadoid	Leporine
2-G-11	Lepal	Lepra

IDEAL Gas Boiler—Continued

Water

Boiler No.	Code Word (Natural)	Code Word (Artificial)
2-G-30	Leprose	Lernean
2-G-40	Leprous	Lerot
2-G-50	Lepry	Lesbian
2-G-60	Leptiform	Lesion
2-G-70	Leptology	Leslie
2-G-80	Leptus	Lessee
2-G-90	Leptynite	Lessing
2-G-100	Lered	Lessive
2-G-110	Lernaea	Lesson

IDEAL Water Tube Boilers

(Code Word ....Lest)

Steam Boiler No.	Code Word	Water Boiler No.	Code Word
S-2305	Letco	W-2305	Lidap
S-2306	Letdu	W-2306	Lidba
S-2307	Leteb	W-2307	Lidci
S-2308	Letfa	W-2308	Liedo
S-2309	Letgi	W-2309	Liefu
S-2905	Levho	W-2905	Liega
S-2906	Levic	W-2906	Liehi
S-2907	Levju	W-2907	Lifjo
S-2908	Levka	W-2908	Lifku
S-2909	Levli	W-2909	Lifla
S-2910	Lewmo	W-2910	Lifmi
S-2911	Lewnu	W-2911	Ligno
S-3605	Lewod	W-3605	Ligor
S-3606	Lewpa	W-3606	Ligpu
S-3607	Lewri	W-3607	Ligra
S-3608	Lexso	W-3608	Ligsi
S-3609	Lextu	W-3609	Lijto
S-3610	Lexuf	W-3610	Ligus
S-3611	Lexva	W-3611	Lijot
S-3612	Lexwi	W-3612	Lijwa
S-3613	Lexyg	W-3613	Lijyv
S-3614	Lezag	W-3614	Lijzi
S-3615	Lezbo	W-3615	Lilav

IDEAL Water Tube Boilers—Continued

(Code Word............Lest)

Steam Boiler No.	Code Word	Water Boiler No.	Code Word
S-4806	Lezcu	W-4806	Lilbo
S-4807	Lezda	W-4807	Lilcu
S-4808	Lezek	W-4808	Lilda
S-4809	Lezfi	W-4809	Lilex
S-4810	Liago	W-4810	Lilfi
S-4811	Liahu	W-4811	Limgo
S-4812	Liaja	W-4812	Limhu
S-4813	Liaki	W-4813	Limiz
S-4814	Liblo	W-4814	Limja
S-7907	Libmu	W-7907	Limki
S-7908	Libna	W-7908	Linlo
S-7909	Libol	W-7909	Linmu
S-7910	Libpi	W-7910	Linoy
S-7911	Licro	W-7911	Linpa
S-7912	Licsu	W-7912	Linri
S-7913	Licta	W-7913	Liobo
S-7914	Licum	W-7914	Liotu
S-7915	Licvi	W-7915	Lioda
S-7916	Lidwo	W-7916	Liofi
S-7917	Lidyu	W-7917	Liogs

IDEAL 15-Inch Sectional Boiler

(Code Word..........Lion)

Steam Boiler No.	Code Word	Water Boiler No.	Code Word
S-15-4	Lipaemia	W-15-4	Liplet
S-15-5	Lipans	W-15-5	Lipogram
S-15-6	Lipic	W-15-6	Lipoma

IDEAL 19-Inch Sectional Boiler

(Code Word..........Lipse)

Steam Boiler No.	Code Word	Water Boiler No.	Code Word
S-19-5	Lipyl	W-19-5	Liqueur
S-19-6	Liquate	W-19-6	Liquidity
S-19-7	Liquefy	W-19-7	Liquidize

• IDEAL 22-Inch Sectional Boiler

(Code Word..........Lira)

Steam Boiler No.	Code Word	Water Boiler No.	Code Word
S-22-5	Lirella	W-22-5	Lisper
S-22-6	Lisbon	W-22-6	Lissom
S-22-7	Lisle	W-22-7	Listel

IDEAL 25-Inch Sectional Boiler
(Code Word........Listful)

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
S-25-5	Litharge	W-25-5	Lithe
S-25-6	Litchi	W-25-6	Lithely
S-25-7	Literacy	W-25-7	Litherly
S-25-8	Literite	W-25-8	Lithic

IDEAL 28-Inch Sectional Boiler
(Code Word........Lithiom)

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
S-28-5	Lilthoogy	W-28-5	Litigant
S-28-6	Lithosian	W-28-6	Litigator
S-28-7	Lithoxyl	W-28-7	Litigious
S-28-8	Lithy	W-28-8	Litimus

IDEAL 36-Inch Sectional Boiler
(Code Word........Litotes)

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
S-36-5	Litter	W-36-5	Lituus
S-36-6	Littoral	W-36-6	Livable
S-36-7	Littress	W-36-7	Livelily
S-36-8	Lituate	W-36-8	Livery
S-36-9	Liturgic	W-36-9	Livid
S-36-10	Liturgy	W-36-10	Livor

IDEAL 48-Inch Sectional Boiler
Without Ideal Smoke Preventing Device
(Code Word........Lixivious)

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
S-48-6	Loach	W-48-6	Lobbish
S-48-7	Loamy	W-48-7	Lobcock
S-48-8	Loathful	W-48-8	Lobelin
S-48-9	Loathy	W-48-9	Lobiped
S-48-10	Lobate	W-48-10	Lobosa

Ideal 48-Inch Sectional Boiler With Ideal Smoke Preventing Device

(Code Word........Lobular)

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
T-48-6	Lobule	T-48-60	Locule
T-48-7	Locale	T-48-70	Loculous
T-48-8	Locellate	T-48-80	Locust
T-48-9	Lochage	T-48-90	Locution
T-48-10	Locken	T-48-100	Lodestar
T-48-11	Lockram	T-48-110	Lodger
T-48-12	Locular	T-48-120	Loess

Ideal Smokeless Down Draft Boiler

(Code Word........Logan)

Steam Boiler No.	Steam Code Word	Water Boiler No.	Water Code Word
364-S	Loggat	364-W	Loobily
374-S	Logging	374-W	Looming
384-S	Logical	384-W	Lophine
394-S	Logogram	394-W	Loppard
3104-S	Logometric	3104-W	Loquat
468-S	Logwood	468-W	Lorate
478-S	Lohock	478-W	Lordkin
488-S	Loimic	488-W	Lorica
498-S	Loincut	498-W	Loricate
4108-S	Loiterer	4108-W	Loriner
4118-S	Loligo	4118-W	Loriot
670-S	Lollard	670-W	Loris
680-S	Loller	680-W	Lorry
690-S	Lomata	690-W	Losange
6100-S	Lombard	6100-W	Losel
6110-S	Loment	6110-W	Losing
6120-S	Lomonite	6120-W	Lothario
974-S	Lompish	974-W	Lotion
984-S	Longan	984-W	Lottery
994-S	Longette	994-W	Loture
9104-S	Longeval	9104-W	Loutus
9114-S	Longitude	9114-W	Lounge
9124-S	Longspun	9124-W	Loutish

BOILER CODE

Premier Boilers
(Code Word........Mascot)

Steam Number	Steam Code Word	Water Number	Water Code Word
1015	Masculine	1115	Meedfully
2015	Masoretic	2115	Meetness
3015	Massiness	3115	Megalith
1018	Masterful	1118	Megascope
2018	Masthead	2118	Melanian
3018	Mastodon	3118	Meliorate
1021	Matachin	1121	Mellific
2021	Matchless	2121	Mellowly
3021	Matelote	3121	Melodious
4021	Mathesis	4121	Melotype
1024	Mattamore	1124	Memphian
2024	Matutinal	2124	Mentorial
3024	Maundril	3124	Mercurial
4024	Maverick	4124	Meridian
1027	Maxillary	1127	Meritable
2027	Mazarine	2127	Merriment
3027	Mazourka	3127	Merulidan
4027	Medallion	4127	Messmate

Peerless Boilers
(Code Word........Metaphor)

Steam Number	Steam Code Word	Water Number	Water Code Word
1500	Metaplast	1501	Middlings
1600	Meteoric	1601	Mightily
1800	Meterage	1801	Milanese
1900	Methodic	1901	Milesian

Standard Boilers
(Code Word........Minstral)

Water

Number	Code Word	Number	Code Word
15-1-W	Minorate	25-3-W	Mobilize
17-1-W	Minstrel	25-4-W	Moccasin
17-2-W	Minuscule	28-1-W	Modenese
17-3-W	Minutely	28-2-W	Modernism
19-1-W	Mirabilis	28-3-W	Modillion
19-2-W	Mirifical	28-4-W	Modulator
19-3-W	Mirthful	31-1-W	Molasses
22-1-W	Misnomer	31-2-W	Molecular
22-2-W	Missioner	31-3-W	Mollifier
22-3-W	Mistletoe	31-4-W	Monarchal
22-4-W	Mitewort	34-1-W	Monaxial
25-1-W	Mitigant	34-2-W	Monetary
25-2-W	Mitriform	34-3-W	Moonbeam
		34-4-W	Moonstone

BOILER CODE

IDEAL Hot Water Supply Boilers
(Code Word........Naevoid)

Number	Code Word
01	Nainsook
02	Nameable
03	Nankeen
04	Napiform
05	Narcissus
06	Narrot
07	Nativity
08	Naturalite
09	Naughty
10 Arco	Narcotine
12 Arco	Narration
15 Arco	Natatory

IDEAL Boiler Parts
List of Sections—All Types

	Code Word
Back Section	Pagenatry
Back Section, Open	Paginal
Center Air Tube Section	Pagoda
Center Connecting Section	Paguma
Center Leg Section	Pahi
Center Section	Paien
Closed Bridgewall Center Section	Palace
Closed Center Section	Palatial
Closed Connecting Section	Paleness
Closed Diving Flue Section	Palette
Closed Rear Center Section	Palisade
Double Section	Panicled
Firepot Section	Pantaloon
First Section over Firepot	Panurgic
Five Flue Center Section	Panyard
Four Flue Center Section	Papagay
Front Center Section	Paparchy
Front Flue Section	Papescent
Front Flue Connecting Closed Section	Papillar
Front Flue Connecting Open Section	Paque
Front Section	Parabola
Grate Center Section	Parachute
Grate Connecting Section	Paraclose
Grate Front Flue Section	Parade
Grate Front Flue Connecting Section	Paradise
Half Open Center Section	Paragram
Half Open Connecting Section	Parapet
Half Open Front Flue Section	Parasang

IDEAL Boiler Parts—Continued

	Code Word
Holland "A" Section	Parasite
Holland "B" Section	Parasol
Intermediate Section for Premier	Paravant
Left End Section	Parboil
Leg Section	Parcase
Open Bridgewall Connecting Section	Parcel
Open Bridgewall Center Section	Parcener
Open Center Section	Parchment
Open Connecting Section	Parietal
Open Diving Flue Section	Parish
Open Rear Center Section	Paritor
Open Rear Connecting Section	Park
Rear Center Section	Parrakeet
Rear Center Air Tube	Parrot
Rear Connecting Section	Partridge
Right End Section	Parture
Second Section Over Firepot	Passport
Single Section	Pasturage
Six Inch Rear Section	Pasty
Space Section	Patache
Steam Dome	Patella
Third Section over Firepot	Patrician
Three Hole Section	Patriet
Two Hole Section	Patrol
Water Dome Section	Patronage
No. 1 Section	Patten
No. 2 Section	Patulous

List of Grate Bars

	Code Word
One Set Grate Bars Only	Perception
One Set Grate Bars Complete with Connecting Bars and Arms	Perchance

Style and Kind of Radiators

	Code Word
Angle 45° Steam	Sagenite
Angle 45° Water	Sagina
Arco Window Steam	Saggital
Arco Window Water	Sahib
Cardinal Indirect	Sanative
Circular for Steam	Sandaled
Circular for Water	Sangaree
Corner for Steam	Santonin
Corner for Water	Saporous
Corto, Steam	Sapsago
Corto, Water	Sapwood
Curved for Steam	Sarcoline
Curved for Water	Sartorial
Dining-Room Steam	Satirist
Dining-Room Water	Saturnism
Direct-Indirect for Steam	Sauterne
Direct-Indirect for Water	Savorous
Excelsior Indirect Steam	Saxonism
Excelsior Indirect Water	Scalable
Italian Ornamental Flue Box-base Steam	Scampish
Italian Ornamental Flue Box-base Water	Scapular
Italian Ornamental Flue Steam	Scarless
Italian Ornamental Flue Water	Scenario
Peerless Flue Steam	Scenary
Peerless Flue Ventilating Steam	Scenical
Peerless Single-Column Steam	Scheming
Peerless Single-Column Water	Scholarly
Peerless Two-Column Steam	Schooner
Peerless Two-Column Water	Sciolous
Peerless Three-Column Steam	Scleroid
Peerless Three-Column Water	Scoparin
Peerless Four-Column Steam	Scorifier
Peerless Four-Column Water	Scotching
Peerless Hospital Single-Column Steam	Scribable
Peerless Hospital Single Column Water	Scrimping
Peerless Hospital Two-Column Steam	Scriptory
Peerless Hospital Two-Column Water	Scrofula
Peerless Hospital Three-Column Steam	Scrutation
Peerless Hospital Three-Column Water	Sculptor
Peerless Hospital Four-Column Steam	Scutiform
Peerless Hospital Four-Column Water	Scyphus
Peerless (formerly Rococo) Window, Steam	Semitone
Peerless (formerly Rococo) Window, Water	Seneschal
Peerless (formerly Rococo) Wall, No. 5-A, Side-tapped, Steam	Senseless

Style and Kind of Radiators—Continued

	Code Word
Peerless (formerly Rococo) Wall, No. 5-A, Side-tapped, Water	Sensorial
Peerless (formerly Rococo) Wall, No. 5-A, Steam	Sentinel
Peerless (formerly Rococo) Wall, No. 5-A, Water	Septangle
Peerless (formerly Rococo) Wall, No. 7-B, Steam	Septuary
Peerless (formerly Rococo) Wall, No. 7-B, Water	Seraphic
Peerless (formerly Rococo) Wall, No. 7-A, Steam	Sergeant
Peerless (formerly Rococo) Wall, No. 7-A, Water	Serotine
Peerless (formerly Rococo) Wall, No. 9-B, Steam	Servable
Peerless (formerly Rococo) Wall, No. 9-B, Water	Servitor
Peerless (formerly Rococo) Wall, No. 9-A, Steam	Setireme
Peerless (formerly Rococo) Wall, No. 9-A, Water	Setulose
Perfection Pin Indirect, ex. large, bolt and flange	Scribble
Perfection Pin Indirect, standard, bolt and flange	Scrivener
Perfection Pin Indirect, extra large, with right- and left-hand threaded nipple connections	Scrutator
Perfection Pin Indirect, standard size, with right- and left-hand threaded nipple connections	Scumming
Sanitary School Pin Indirect, Steam	Severity
Sanitary School Pin Indirect, Water	Sextoness
Single Foot, Steam	Sextuple
Single Foot, Water	Shackle
Sterling Indirect	Shadiness
Vento Blast Radiator, Regular, 30-inch	Shagbark
Vento Blast Radiator, Regular, 40-inch	Shagreen
Vento Blast Radiator, Regular, 50-inch	Shalloon
Vento Blast Radiator, Regular, 60-inch	Shapeless
Vento Blast Radiator, Regular, 72-inch	Sharking
Vento Blast Radiator, Narrow, 40-inch	Shattery
Vento Blast Radiator, Narrow, 50-inch	Shearing
Vento Blast Radiator, Narrow, 60-inch	Shedding

Radiator Miscellanies

	Code Word
Arco Adjustable Wall Brackets, for 1 row	Shirting
Arco Adjustable Wall Brackets, for 2 rows	Shivers
Box-base with back opening, Detroit Plant	Sibilant
Box-base with bottom opening, Detroit Plant	Sicilian
Box-base with back opening, Titusville Plant	Sidereal
Box-base with bottom opening, Titusville Plant	Sidewalk
Box-base, New Adjustable, back opening	Sighingly
Box-base, New Adjustable, bottom opening	Sigmoidal
Brackets, No. J	Signally
Brackets, No. K	Signetted
Brackets, No. L	Silently
Brackets, No. M	Silicide
Brackets, No. MM	Silkiness
Brackets, No. N	Silurian
Brackets, No. O	Silverize
Brackets, No. P	Similize
Bushings, 2 inches, reducing to 1½ inches	Simperer
Bushings, 2 inches, reducing to 1¼ inches	Simpleton
Bushings, 2 inches, reducing to 1 inch	Simulator
Bushings, 2 inches, reducing to ¾ inch	Sincaline
Bushings, 2 inches, reducing to ½ inch	Sincerity
Bushings, 1½ inches, reducing to 1¼ inches	Sinecure
Bushings, 1½ inches, reducing to 1 inch	Singingly
Bushings, 1½ inches, reducing to ¾ inch	Sinistral
Bushings, 1½ inches, reducing to ½ inch	Sinlessly
Concealed Brackets	Siphonic
Concealed Brackets (Peerless)	Sirgang
Nipples, 2 -inch 90° right- and left-hand	Sketcher
Nipples, 1½-inch 90° right- and left-hand	Skiffing
Nipples, 2-inch 90° right- and left-hand with hexagon nut at center	Skilling
Nipples, 2 -inch, 60° right- and left-hand	Skimming
Nipples, 1½-inch 60° right- and left-hand	Skirmish
Nipples, 2-inch 60° right- and left-hand (hexagon nut)	Skirting
Nipples, 2-inch, right-hand threaded	Slackness
Nipples, 2¼-inch Slip	Slakeless
Pedestals....inches high	Slapping
Pedestals to make distance from floor to center of supply tapping....inches	Slatting
Plugs, 2-inch	Sledding
Plugs, 1½-inch	Sleepless
Plugs, ⅛-inch Brass (for air valve tapping)	Slicking
Plugs, ⅛-inch Iron (for air valve tapping)	Sliding
Saddles for marble tops	Slimness

Radiator Miscellanies—Continued

	Code Word
Seidel Single Wall Radiator Bracket	Slipshod
Tops, fitted with lugs for marble	Slitting
Tops, fitted with saddles for marble	Slothful
Wall Boxes, iron, 5x17½	Sludger
Wall Boxes, iron, 8x25	Slumber
Wall Boxes, bronze, 5x17½	Slumming
Wall Boxes, bronze, 8x25	Slushy

Number of Sections

	Code Word
2 Sections	Smallish
3 Sections	Smartness
4 Sections	Smelling
5 Sections	Smilingly
6 Sections	Smithery
7 Sections	Smokable
8 Sections	Smoothing
9 Sections	Smuggler
10 Sections	Snaffling
11 Sections	Snapping
12 Sections	Snattock
13 Sections	Sniffing
14 Sections	Snippack
15 Sections	Snowless
16 Sections	Snuffers
17 Sections	Snugness
18 Sections	Solacing

	Code Word
19 Sections	Solidary
20 Sections	Solitude
21 Sections	Sonnetize
22 Sections	Soothing
23 Sections	Sorcerer
24 Sections	Sorriness
25 Sections	Sotadean
26 Sections	Sounding
27 Sections	Soutache
28 Sections	Sovereign
29 Sections	Spacious
30 Sections	Spadeful
31 Sections	Spadroon
32 Sections	Spanking
33 Sections	Sparable
34 Sections	Sparkler
35 Sections	Sparsely

Names of Sections

	Code Word
Blank Leg Section, Steam	Speedless
Drip Leg Section	Spelling
Intermediate Hot-Water Leg Section	Spending
Intermediate Hot-Water Section	Spheroid
Intermediate Steam Section	Sphingid
Intermediate Steam Leg Section	Spiciness
Return Steam Leg Section	Spiculum
Return Hot-Water Leg Section	Spiderly
Supply Hot-Water Leg Section	Spikelet
Supply Steam Leg Section for double pipe	Spilikin
Supply Steam Leg Section for single pipe	Spindled
Supply Steam Leg Section with both supply and return at bottom	Spinning

Heights

	Code Word		Code Word
13 -inch Ht.	Splutter	26 -inch Ht.	Spurrier
14 -inch Ht.	Spoilable	27 -inch Ht.	Sputter
15 -inch Ht.	Spoliate	27½-inch Ht.	Spyglass
16 -inch Ht.	Spongoid	28 -inch Ht.	Squander
18 -inch Ht.	Spoonful	30 -inch Ht.	Squaring
19 -inch Ht.	Sporadic	31 -inch Ht.	Squatter
19½-inch Ht.	Sporran	32 -inch Ht.	Squeaker
20 -inch Ht.	Sporting	33 -inch Ht.	Squelched
21½-inch Ht.	Spotless	33½-inch Ht.	Squirrel
22 -inch Ht.	Spreading	34½-inch Ht.	Stabling
23 -inch Ht.	Springing	38 -inch Ht.	Staccato
24 -inch Ht.	Sprinter	39½-inch Ht.	Stackage
25 -inch Ht.	Sprucely	44 -inch Ht.	Staggard
		45 -inch Ht.	Stainless

Quantity

	Code Word		Code Word
200 sq. ft.	Starched	3,500 sq. ft.	Stipuled
300 sq. ft.	Startling	4,000 sq. ft.	Stockade
400 sq. ft.	Stationer	5,000 sq. ft.	Stoniness
500 sq. ft.	Statutory	6,000 sq. ft.	Storming
600 sq. ft.	Steadfast	7,000 sq. ft.	Straggler
700 sq. ft.	Stealthy	8,000 sq. ft.	Stramash
800 sq. ft.	Steerage	9,000 sq. ft.	Stratagem
900 sq. ft.	Stellular	10,000 sq. ft.	Streamer
1,000 sq. ft.	Stentorin	12,000 sq. ft.	Stressful
1,200 sq. ft.	Sternness	15,000 sq. ft.	Strigate
1,500 sq. ft.	Stibnite	20,000 sq. ft.	Striking
1,800 sq. ft.	Sticking	25,000 sq. ft.	Stripling
2,000 sq. ft.	Stilbene	30,000 sq. ft.	Stroller
2,500 sq. ft.	Stillion	40,000 sq. ft.	Stropping
3,000 sq. ft.	Stingily	50,000 sq. ft.	Stubborn

Tapping Instructions

	Code Word
¾-in. single pipe	Stunning
¾x¾-in	Stupidly
1 in. single pipe	Sturgeon
1 x ¾-in.	Stylishly
1 x1 -in.	Styptical
1¼-in. single pipe	Subaltern
1¼x ¾-in.	Subastral
1¼x1 -in.	Subdulcid
1¼x1¼-in.	Subjacent
1½-in. single pipe	Sublimate
1½x1 -in.	Submersed

Tapping Instructions—Continued

	Code Word
1½x1¼-in.	Subpolar
1½x1½-in.	Subserve
2 -in. single pipe	Subtilely
2 x1½-in. pipe	Suburbed
2 x ½-in. Eccentric	Suburban
2 x ¾-in. Eccentric	Subvention
1½x ½-in. Eccentric	Subversive
1½x ¾-in. Eccentric	Subway
1½ L. H.x½-in. R. H. Eccentric	Succeed
Tapped at "A"	Succinct
Tapped at "B"	Succotash
Tapped at "C"	Sudatory
Tapped at "D"	Sufficing
Tapped at "E"	Sugaring
Tapped at "F"	Sullenly
Tapped at "G"	Sulphonic
Tapped at "H"	Summarist
Tapped right hand	Sumptuous
Tapped left hand	Sunshine
Tapped for single-pipe Steam as per list	Superbly
Tapped for double-pipe Steam as per list	Superfine
Tapped for top supply and bottom return on same end	Superior
Tapped for top supply and bottom return on opposite ends	Superpose
Tapped for both supply and return tappings at bottom of same end	Supinely
Tapped for ¼-inch air valves	Suppliant
All to have extra-high solid legs, so that the distance from floor to center of supply tapping shall be. . . .inches	Sureness
Insert blind nipple at top between loop and return leg section	Surmising
Outside thread to be left-handed	Surrender

SPECIALTIES CODE

	Code Word
Air Valves, Ideal Air Line, No. 816	Talesman
Air Valves, Compression, W. W. No. 520	Tallness
Air Valves, Compression Key, No. 521	Tamarisk
Air Valves, Ideal Airid, No. 560	Tanbark
Aquastat, Honeywell, No. 729	Tawdry
Asbestos Cement, Plastic (....pounds of)	Tearless
Asphaltum Black (....gallons of)	Teething
Bronze, Aluminum, in one-pound cans	Telluric
Bronze, Pale Gold (....pounds of)	Tellable
Bronze, Rich Gold (....pounds of)	Temperate
Bronzing Liquid (........cans of)	Temporal
Brushes, Flue	Tensible
Covers, De Luxe, All-Steel Radiator No. 908	Tensive
Draw Off Cock, Ideal, No. 170	Tenting
Diaphragm, Rubber	Tepidity
Elbows, Union (No. 132)	Termless
Floor and Ceiling Plates, Plain, No. 706	Testament
Floor and Ceiling Plates, Nickel-Plated, No. 707	Testate
Gauge, Combination, Altitude and Thermometer, No. 588	Testify
Gauges, Steam Retard	Tetragon
Gauges, Steam	Tetrapod
Gauges, Altitude	Textural
Generator, Honeywell Mercury	Theorem
Hack Saw, Rotary, No. 739	Theoretic
Heater, Domestic Taco, No. 626	Theoria
Heater, Flo-Line Taco, No. 627	Theosis
Heater, Apartment Taco, No. 628	Theralite
Heater, Water Excelso, No. 740	Theurgic
Heater, Universal Taco No.	Therapod
Honeywell Tank in Basement Combination (No.....)	Thetic
Mercoid Thermostat No. 845	Thole
Putty for Boilers (....pound can)	Thoracic
Regulator, Honeywell Temperature, (No....)	Throbbing
Regulator, Arco Steam, No. 805	Throng
Regulator, Arco Water, No. 800	Tickle
Regulator, Arco Jr. Water, No. 801	Tidal
Regulator, Arco Tank, No. 825	Tincture
Regulator, Arco Tank, No. 826	Tinsel

	Code Word
Shank, Air Valve Airid Straight, No. 502	Tinter
Shields, Radiator (with vapor pan)	Titrated
Shields, Radiator (without vapor pan)	Toadstool
Stems, Extension for Valves	Toast
Tank Brackets	Toboggan
Tank Trimmings, Expansion	Toilless
Tanks, Expansion, Galvanized Steel (No...)	Tollable
Tanks, Storage, Black Steel (No.....)	Torpidity
Tanks, Storage, Galvanized (No.....)	Tortoise
Thermometers, Straight	Toucanet
Thermometers, Angle	Touchily
Valves, Relief Arco Compound	Touchstone
Valves, Detroit Equalising H. W. No. 104	Tough
Valves, Detroit Equalising H. W. No. 105	Tousle
Valves, Gas, Snap-Acting	Toxic
Valves, Gate, No. 373, Wood Wheel, Brass Union	Tractable
Valves, Globe, No. 57, Wood Wheel, Union	Tragopam
Valves, Hot Water Improved, No. 101	Trampot
Valves, Ideal Fractional Packless, No. 868	Trance
Valves, Ideal Packless, Angle, No. 850	Transom
Valves, Ideal Packless, Globe, No. 860	Trapeze
Valves, Ideal Packless, R. H. Corner, No. 851	Trappoid
Valves, Ideal Packless, L. H. Corner, No. 852	Trashy
Valves, Ideal Super-Packless, Angle No. 878	Trattle
Valves, Ideal Super-Packless, Angle No. 888	Trauma
Valves, Ideal Super-Packless Globe No. 870	Travado
Valves, Ideal Super-Packless, R. H. Corner, No. 879	Travale
Valves, Ideal Super-Packless, L. H. Corner, No. 880	Travoy
Valves, Detroit Multiport, No. 168	Treasured
Valves, Pop Safety, Ideal No. 971	Treating
Valves, Pop Safety Vapor, No. 961	Trembling
Valves, Steam, Angle with Union, No. 72	Trenchant
Valves, Steam, Corner, R. H., No. 32	Trespass
Valves, Steam, Corner, L. H., No. 37	Trailogue
Valves to be equipped with lock and shield	Tribunal
Vent, Ideal Quick, No. 815	Tribute
Vent, Ideal Quick, No. 820	Triceps
Vento Vent, Ideal, No. 817	Trident
Wrenches, Spud, Style 1	Triumphal
Wrenches, Spud, Style 2	Trolling

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